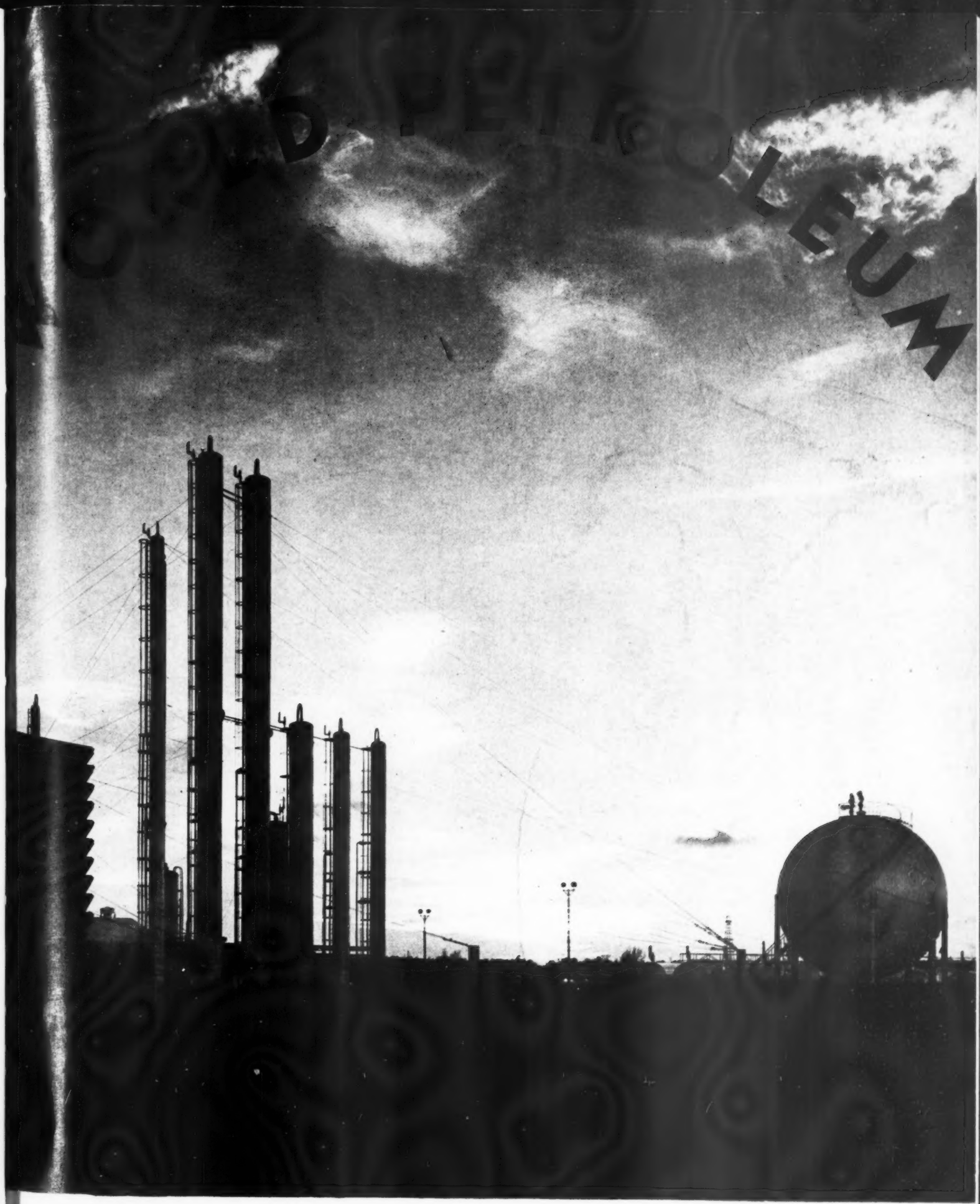

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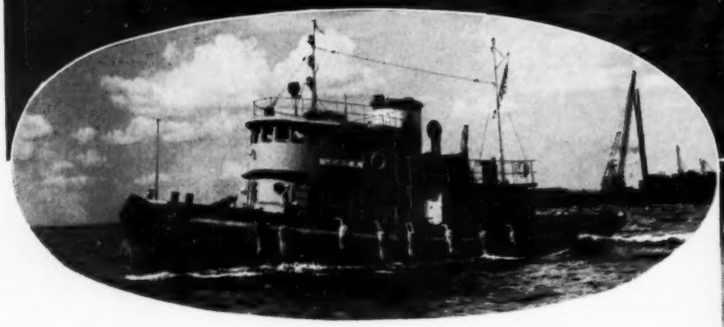

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WORLD PETROLEUM

Founded by Russell Palmer

PUBLISHED BY MONA PALMER

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THIS MONTHS COVER—Sunset at the Hawkins, Texas, gasoline plant of Natural Gasoline Corp. and Humble Oil & Refining Co. This plant was built during the war to produce special aviation components. With superfractionation facilities it now manufactures special pure cuts of pentane, hexane, heptane and octanes in addition to natural gasoline and liquefied petroleum gases. Photograph by Robert Yarnall Richie, courtesy of Warren Petroleum Corp., marketers of the plant output.

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EDITORIAL

EARNINGS FAR SHORT OF CAPITAL DEMANDS

IN volume of products sold, the year 1947 set a record well above that of any previous year in the history of the oil industry. In the United States all divisions of the industry operated at the top rate permitted by available facilities. This high degree of activity, aided by a general rise in prices, was reflected in higher dollar earnings. It is noteworthy, however, that the price increase in the case of petroleum products has been far less than the rise that has taken place in other commodities in general use. Such increase as has occurred has been forced by the mounting pressure of demand for crude, both for domestic and export use, and its effects have been applied with restraint along the lines of its conversion into products.

For the twenty-five companies whose financial operations have been annually reviewed by WORLD PETROLEUM over a period of years and whose reports for 1947 are summarized on other pages of this issue, the combined income during 1947 was 280 million dollars, an increase of 142 million over 1946. This is a large and, of course, a quite exceptional rise, though it represents a lower rate of return than that of many companies in other industries during the same period. To make the comparison solely on the numerical difference, however, conveys an erroneous impression due to conditions thoroughly familiar to oil men but not so well understood outside.

Companies engaged in the production of oil are dealing with a wasting resource. To maintain their volume of output necessitates continuous exploration of new areas, the drilling of more and deeper wells and the introduction of methods of pressure maintenance and other measures of conservation. These, of course, are normal requirements of the business, but the important point as affecting current operations is that all of them are tremendously more expensive today than they were a decade ago or even as recently as the last prewar year, 1941. Whether wells be judged by a footage standard or on results in the way of production, their average cost is double that of the prewar period and in many regions three or four times as great.

Similarly the expense of constructing or enlarging a refinery has risen in like degree. The equipment required is more elaborate, and the life expectancy of the plant has been greatly reduced by the rapid progress of research which has stepped up the rate of obsolescence to a point where it is often said that a plant begins to be out of date before it is finished.

In other words the oil industry is engaged in purveying goods obtained at costs far below the figure at which they could be provided today. Charges to depreciation and reserves, being based on these lower costs, are inadequate to permit replacement at the currrent price level. The industry is in somewhat the position of a shopkeeper whose shelves are stocked with merchandise bought at prewar rates. With a substantial markup in his original prices, he appears to be making satisfactory profits but finds when he comes to replenish his inventory that he really has been doing business at a loss.

Traditionally the oil industry has accomplished its growth largely by plowing back a large proportion of its earnings for the purpose of enlarging its operations. In periods of rapid expansion it has acquired funds by bank loans or the sale of bonds and shares and has reduced or repaid its borrowings during intervals of more stable activity. With the swift upsurge in demand for its products since the close of the war, it has entered an era in which capital expenditures necessary to meet the increases have assumed staggering proportions judged by earlier standards. Prior to the war the average yearly investment of American oil companies in new facilities was below $700 million. It has now jumped suddenly to more than $2,500 million. Put in simpler form, the dollars earned have shrunk to less than 40 percent in actual purchasing power.

To meet the task of providing facilities for present and prospective demands, the oil companies first of all have cut down the percentage of earnings passed along to owners of the companies, the shareholders, in dividends. Dividend payments absorbed only 34.8 percent of income in 1947 compared with 42 percent in 1946 and 47 percent in the previous year. Secondly, withdrawals are made from capital surplus and reserve accounts to fill a large portion of the gap. The remainder is being obtained through loans and stock flotations.

Based on a study of 30 representative oil companies, Joseph E. Pogue, vice president of Chase National Bank and a recognized statistical authority, has computed that capital expenditures of this one group of companies in 1947 amounted to $2,076 million, of which $1,704 million came from company funds, being $1,136 million in excess of charges for depreciation, depletion and the like. In 1948, Mr. Pogue calculates, the same companies will have capital outlays of $2,300 million and will require $400 million from loans or sale of stocks. It is fortunate for the oil industry and even more fortunate for the consumers of its products that the great majority of oil companies have followed a consistent policy of reinvestment of the bulk of their earnings and of building substantial reserves.

PROMISING FUTURE FOR PERU'S OIL

The refineries at Talara are fed by pipe line from the oil fields on the desert coast of Peru.

By Dr. J. E. Rassmuss
Consulting Geologist, Lima

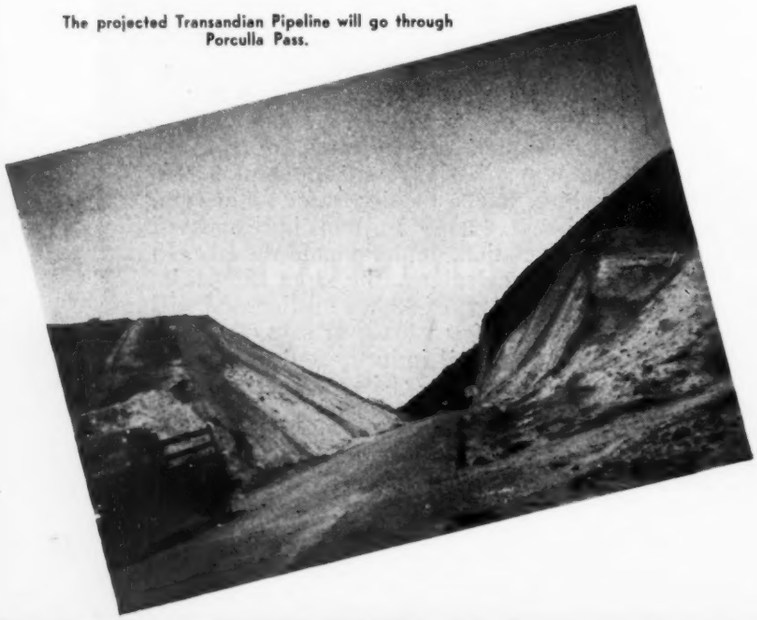
PRODUCTION of crude oil in Peru during 1947, according to official figures, amounted to 12,763,809 barrels or 35,000 barrels daily, a gain of 2.5 percent over the 12,486,126 barrels yielded in 1946. Including 890,848 barrels of natural gasoline produced by International Petroleum Co. and 109,906 barrels from Lobitos Oil Fields Ltd., the total production of all oils in 1947 was 13,764,563 barrels or 1,807,065 metric tons.

Crude production for the year was derived from the following sources:

International Petroleum Co.	10,205,658
Lobitos Oil Fields Ltd.	2,321,967
Government Fields	118,174
Ganso Azul	118,010
Total	12,763,809

As shown by the above, 80 percent of the output came from the Brea-Parinas fields of International Petroleum Co. Although reserves in this area are declining, production has been maintained in the neighborhood of 10 million barrels yearly. By the adoption of scientific methods of exploitation and the application of water flooding and other means of pressure maintenance, production from the Pueblo pool has been sustained, although the yield per well has declined gradually to about 12 barrels daily. In the

The projected Transandian Pipeline will go through Porculla Pass.



Camp at Ganso Azul with mud pit in foreground.

oldest part of the Negritos fields the 250 wells are all strippers supplying together about 500 barrels daily. Parinas, located on the Jabonillal uplift in the northern part of the concession, provides about 6,000 barrels daily from the Parinas sandstone of Middle Eocene age, which is also the most productive zone in the central field. Most of the wells are flowing from depths that vary from 2,000 to 4,000 feet. Deep drilling, including one well carried to 11,500 feet in the southern part of the concession, has not brought impressive results. The company, however, continues its drilling activity with 16 rigs, half of which are employed in exploratory work.

An important recent development in International operations is the production of liquefied gas from propane and butane for domestic use. This is a boon to the local population, since other forms of low-priced fuel are scarce in Peru. As production expands, it is planned to extend the sale of gas to other markets along the Pacific Coast.

Lobitos Oil Fields, Ltd., further north, has two principal fields with remaining reserves estimated to be equal at least to the total past production of 85 million barrels. The Lobitos field recovers about 2,000 barrels daily from the Lower Eocene Caverno sandstone. El Alto field, about 35 kilometers to the north, provides about 6,000 barrels daily, mainly from higher Eocene sands, called the Echinocyamus sands, the Cabo Blanco sandstone and the Helico Lepidina sandstone. Part of the production comes from shallower wells of 1600-1900 feet. Lower horizons, the Restin and Ostrea beds, the latter corresponding to the Parinas sandstone in the south, have given encouraging results. Both fields are located on anti-clinical uplifts, broken by numerous faults. Earlier wells in the fields were put down by the use of cable tools, but drilling progress is now being stepped up by the introduction of rotary rigs. The number of flowing wells is small, and the average yield per well is only eight to nine barrels, but lifting costs are kept low by a central pumping system. In the El Alto field a single pumping unit of 15 HP handles up to 14 separate wells.

Gas from the Lobitos field is processed to yield about 300 barrels daily of natural gasoline. The company's oil output is all exported as crude. Port facilities for seagoing tankers are located at Lobitos and at Cabo Blanco, the latter handling El Alto production. A pipeline built during the war connects with Talara.

The State Oil Exploitation started in 1938 with the purchase of the Zorritos field and the Organos concessions from private Peruvian interests. Zorritos probably is the oldest field on the continent, dating back to 1865, but its production now is only about 300 barrels daily. Along the crest of the Organos structure, some 100 kilometers to the south, 11 wells are in operation producing around 300 barrels daily from depths of 500-600 kilometers. The Organos anticline is a pronounced uplift composed of Pozo shales of Upper Eocene age, partially covered by Verdun sandstone. The oil is of high quality, averaging 42-43° API.

In the opinion of geologists who have visited this region, deeper drilling very probably would open more productive zones. It is the intention of the recently organized Empresa Petrolera Fiscal to expand exploration in this area by introduction of modern high-powered drilling equipment, by systematic exploration and by entering into drilling engagements with private contractors.

Oil from the Organos field which is on the coast is transported by government tankers to the refinery of Villar near Zorritos. This refinery is rated at a capacity of 1,000 barrels daily and was built by The Lummus Company in 1940. In actual operation it frequently processes 1200-1300 barrels daily. It treats all the crude from government fields as well as the 10 percent royalty from Lobitos. Its products are sold for domestic consumption.

Highest oil field in the world and southernmost in Peru is Pirin, located at an altitude of 12,000 feet on the shore of Lake Titicaca near the Bolivian boundary. Some 300,000 barrels of oil have been obtained from shallow wells near the seepages of Pirin, but exploration under government auspices including the drilling of 13 wells on the reversed monocline to the tectonical Titicaca trough has been unsuccessful. New attempts in more distant and less disturbed areas may be made later in view of the importance of even small production in supplying the needs here.

About half of the territory of Peru, the so-called Montana, comprising the eastern slope of the Cordillera and the adjoining Amazonas basin, is covered by dense jungle. Geologically it represents the border region on the Andean Mesozoic geosyncline against the Brazilian shield. A great thickness of Cretaceous and Tertiary sediments has been deposited there. According to the changes of the shoreline of the Cretaceous sea, sandstones, of continental and coastal origin alternate with marine fossiliferous shales and limestones, indicating the different regressions and ingressions from the Pacific side.

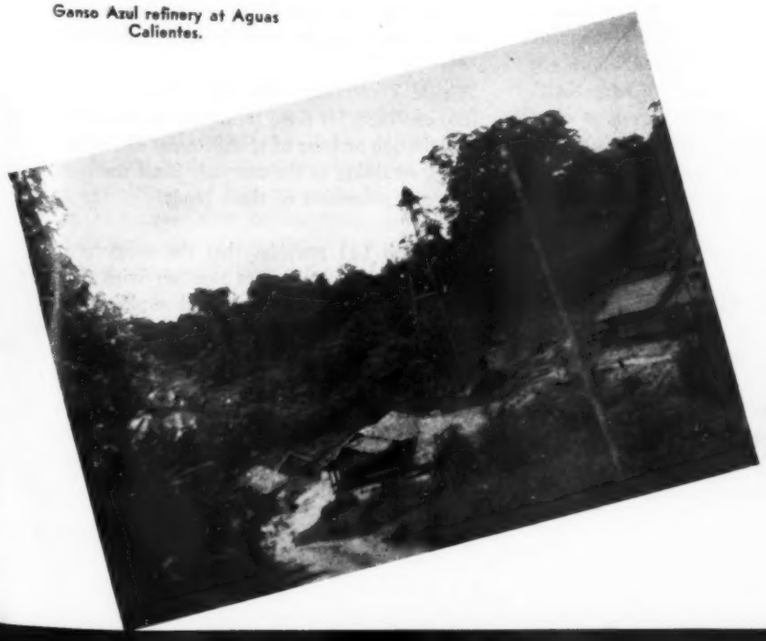
The Cretaceous is divided into the lower sandstone series, in which a group of shales is intercalated, called Agua Caliente or Chonta formation and the upper Sugar or Vivian sandstone. But the limits of these formations are not fixed. The Tertiary is composed of the Red Beds which reach a thickness from 5,000-10,000 feet. Estuary deposits, apparently from the Atlantic side, are represented by the fossiliferous Pliocene beds of Iquitos and Pebas in Peru and Aquidaban in the Acre territory of Brazil.

The Peruvian Ucayali and Amazonas basin geomorphologically is an unlifted peneplain of late Pliocene age, in which the rejuvenated torrential rivers in inherited meanders of the former geographical cycle are everywhere cut in low Tertiary cliffs.

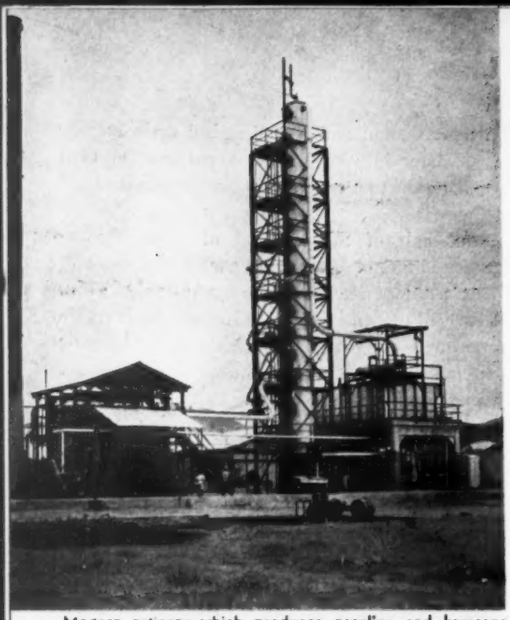
From the Madre de Dios and the Urubamba rivers in the south of the Ecuadorian border in the north, oil seepages are known in many parts of this area, indicating favorable conditions for the origination of oil deposits during the Cretaceous period and its accumulation and preservation by the alternation of permeable sandstone and impermeable shale beds.

The only commercial deposit thus far exploited is the Ganso Azul in the Pachitea region. The oil is found in the Lower Cretaceous Agua Caliente sandstone, forming a domelike structure, discovered first from the air. But the visible struc-

Ganso Azul refinery at Aguas Calientes.



Santa Clara rig in the Ucayali region.



Modern refinery which produces gasoline and kerosene for the Peruvian Army and Navy.

ture reproduced many times in aerial views, does not correspond completely to the underground anticline, represented by the contour lines of the ashbed just below the oil horizon. The oil field is a typical example of a waterdriven deposit, originated by a water table in the Shira mountains which rise in the south to 8,000-10,000 feet altitude. The grade of the oil is high, 43,-44° API, sulfur being almost absent, 0.1 percent. The six flowing wells have a potential yield of nearly 9,000 barrels daily. But production is shut down to about 350 barrels because of the lack of transport and marketing facilities. Present consumption of petroleum products in the Peruvian department of Loreto is less than 80,-000 barrels yearly. After building the 48-mile pipeline to Pucallpa on the Ucayali river and improving the river transport as projected, production of the field could easily be raised to 3,000 barrels daily, providing one million barrels yearly for export from Iquitos. Accumulative production of Ganso Azul has been so far about 500,000 barrels including 1947.

Further north on the Ucayali river appear on the eastern side the last outlayers of the Cordillera folding, the Contamana mountains, the Contaya dome and the Sierra de Moa in the Brazilian territory of Acre. In the Contaya dome fossiliferous Ordovician outcrops below the Cretaceous, and in the Sierra de Moat in the east the lower sandstone series has thinned out to only 1,000 feet, covering in uncomformity paleozoic rocks of the Brazilian shield. Oil prospects are, therefore, unfavorable in the region. East of Contamana oil seepages are still found on the western foot of the Contamana mountains. On the northern spur of those hills, on the top of the Canchahuayo anticline the Peruvian oil company, El Oriente, drilled an exploratory well last year which passed only dry sandstones and touched in 2,500 feet an igneous rock, either of intrusive origin or already belonging to the basement.

In the Ucayali depression where generally only Tertiary Red Beds are exposed, between the Contamana mountains in the east and the last southern spurs of the Eastern Cordillera, the Cerros Cushabatay, in the west, a small dome-like structure with lower Cretaceous outcropping in its center, is the Santa Clara dome. Upon this structure, which is interesting because of a possible more complete development of the oil-bearing lower Cretaceous series, the government is drilling the Santa Clara well. Other tertiary anticlines of the Red Beds in the lower Ucayali region may offer favorable prospects.

The company El Oriente is starting a new well farther south on the western side of the Ucayali river, located on a Tertiary anticline at the Pisqui river about 55 kilometers in a straight line to the west of its mouth in the Ucayali. Gas seepages are known farther up the Pisqui river. Prospects are generally considered favorable in the Montana region, but transport difficulties have delayed development. The navigability of the rivers far inside the country, to Borja in the west up the Maranon river and to Atalaya in the south on the Ucayali river, facilitate transport of the necessary material, but the young geomorphological character of the rivers, changing their course and accumulating irregular sand bars, and the low water during the dry season offer many obstacles to the regular transport of bigger shipments of crude or its products. The major oil companies which have shown interest in the Montana have, therefore, considered the project of a Transandean pipeline, 300 miles long, from Borja on the Maranon river over the Porculla pass, 2,144 meters high, (about 7,000 feet,) the lowest gap in the Cordillera, to Bayovar on the Pacific Ocean. A consideration favoring this project, if sufficient production can be found, is the existence of good markets for oil on the Pacific Coast as far north as California. But the huge investments necessary for this enterprise, which presumes first the previous location of proven reserves for a daily production of around 100,000 barrels, will delay for many years the realization of this project.

At present the outlet to the Atlantic seems more convenient. The vast territory of Brazil produces only some 250 barrels daily (94,000 barrels in 1947,) in the Bahia field; the consumption amounted to 16,073,549 barrels in 1946. The distance from Iquitos to Para at the mouth of the Amazon is roughly 2,000 nautical miles. Iquitos, with a usual depth of 26 feet, falling only to 16 feet in the dry season, is accessible for tankers of 60-70,000 barrels. But transport by barges to Para is possibly more economical. On inland waterways in the United States one tug of 2,000 HP is able to carry 12 barges with a capacity of more than 100,000 barrels at once, at a lower cost than by self-propelled equipment. On the Danube in Europe one tug drives 10 steel barges of 1,000 tons capacity each.

The distance from Para to Aruba or Maracaibo (1700-1800 nautical miles) is only slightly less than to Iquitos, so that the Montana oil could compete in the markets of Brazil, Uruguay and Argentina, taking into account its high grade and absence of sulfur. The price of Arabian crude of 36° API was fixed recently at $1.30 U. S., f.o.b. Ras Tanura, at 9,000 nautical miles distance from New York. Distance from Para to Dakar on the African coast is 2,000 miles.

Considering the favorable situation of Iquitos in relation to the southern South American and African markets, the high grade of oil, a possibly low production cost from flowing wells and improving the transport facilities farther up the rivers by the establishment of government dredges at shallow passes, the exploitation of the Montana oil should offer a commercial basis for supplying increasing world demand.

A decree of the Peruvian government issued on April 2 established the Empresa Petrolera Fiscal. This action, following a veto by the President of a bill approved by Congress for creation of a company called Corporacion de Petroleo, was interpreted in some quarters outside the country as a move to create a government monopoly in the development of Peruvian oil reserves.

According to a statement by the Director of Mines and Petroleum, this is not the case. While operating under government auspices, the participation of private capital is not excluded. The primary purpose is to facilitate the development of the oil industry in Peru, hampered by the failure of Congress up to this time to enact the the proposed petroleum law.

To this end it transforms the former Establecimientos Petroleros Fiscales into an autonomous industrial company, increasing its authorized capital to 200 million soles (30 million dollars) and empowering it to make financial agreements with national or foreign capital. Its board will be presided over by the Minister of Fomento with one executive vice president and five directors, of whom two will be nominated by the Minister of Fomento, two by the Minister of Finance, and one will represent the armed forces. Two managers, one technical and one commercial, will be entrusted with the administration of the new company.

The company is expected to undertake active exploration and exploitation of the government holdings, which comprise the reserve of Zorritos on the northern coast, enclosing several unexplored structures in the Department of Tumbes, and the reserve in Montana (Amazonas region), where a well in Santa Clara has been started, and possibly to resume drilling in the Perin area in the Titicaca region. This work is to be accomplished by new equipment of the company and by drilling contracts with private enterprises.

Article 2 authorizes the new company to enter into contracts for fixed terms for the exploration, exploitation or lease of specific areas of petroleum lands, retaining to the company itself the ownership and possession of those lands.

Paragraph (g) provides that the company may organize mixed companies together with private capital for the exploration and exploitation of certain areas of petroliferous lands allocated to the company, or for the refining, transport or distribution of the products of the company. Such contracts do not require the approval of Congress. These provisions give a legal base for the resumption of oil activities and for the enlistment of private capital, national or foreign.

INDUSTRY CAN MEET YEAR'S DOMESTIC NEEDS

Washington

OUTSIDE of politics, no one subject has been more widely discussed in the past few months than the oil situation in the United States. Some of the discussion in fact has mixed the two topics to the point of complete confusion, and pronouncements ostensibly presenting information on oil have strayed a long way from the factual in order to fit the political aims or prejudices of their authors.

As usual Congress has played a leading part in this phase of the situation. No less than a dozen committees have directed some part of their attention to petroleum during the current session, but it cannot be said that they have done much if anything to clarify the outlook. Senator Wheery's committee dealing with small business affairs has industriously publicized all charges of discrimination in the distribution of products which mostly have faded out on investigation. The Brewster committee, after some spectacular performances, produced as the chief result of its deliberations a charge that the Navy had overpaid the Arabian-American company $30,000,000 on purchases of oil. The report was promptly followed by a statement from the Secretary of the Navy that actually a saving of $33,000,000 had been made as compared with the cost of the same quantity, had it been bought in Gulf Coast ports or in the Caribbean. Finally the Armed Services Committee of the House came up with the time-worn assertion that the United States has only a twelve-year supply of petroleum remaining, coupling with it the observation that in the event of war the country would be short three million barrels of oil daily. The committee also recommended that the President appoint a commission to investigate the petroleum situation, a highly original suggestion in view of the fact that the industry has been under almost continuous investigation for the past dozen years or more by committees that have ploughed the same ground over and over again.

In the meantime the industry itself has been giving careful study to its position and to the supply outlook for the current year. Estimates have been made by a number of statistical authorities, and these substantially agree in their general conclusions. More authoritative than the estimates of individuals is the report prepared by the special sub-committee of the American Petroleum Institute appointed to study the short-term availability of supplies. Short-term in this connection means the second, third and fourth quarters of 1948 and the first quarter of 1949.

The sub-committee's study was confined to domestic requirements. Its report explains that its estimate of supply (which is generally regarded as being on the conservative side,) is based on its judgment of the maximum quantities that can be produced under proper conservation methods in accordance with state laws and regulations, but taking into account additions to productive capacity. It accepts the Bureau of Mines calculations of exports and imports and assumes that there will be no unusual interference with the movement of products from government controls or from strikes or failures to deliver materials.

With these qualifications the committee estimates domestic production by quarters from April 1, 1948, to March 31, 1949, as follows:

	1948 2nd Q	1948 3rd Q	1948 4th Q	1949 1st Q	Average 12 Mos.
	Thousand Barrels Daily				
Crude oil	5,450	5,505	5,555	5,600	5,528
Natural gasoline, condensates, etc.	394	402	416	421	408
Total Domestic Supply	5,844	5,907	5,971	6,021	5,936
Total Domestic Supply Previous year	5,383	5,549	5,707	5,736	5,594
Increase %	8.6	6.5	4.6	5.0	6.1

The estimated average domestic productive capacity for the calendar year 1948 is 5,865,000 barrels daily, which is 7.6 percent over 1947, peak postwar year, 17.1 percent over 1945, the peak war year, and 44 percent over 1941, the peak prewar year.

"During the past summer-winter period," says the report, "imports and exports were practically in balance (13,000 barrels daily net imports). For the coming summer-winter period a net import of 102,000 barrels daily (based on Bureau of Mines estimates) will be available in addition to domestic supply, thereby increasing overall domestic availability. This figure was obtained by using the Bureau of Mines estimates of imports and exports for the year 1948 and, arbitrarily, in the first quarter of 1949 using an import figure equal to that of the Bureau of Mines for the fourth quarter of 1948 and export figure equal to that of the first quarter of 1948. If this import-export condition actually occurs, it will be the first time in 25 years that the United States was a net importer over a calendar year.

"In determining availability of crude for refineries, provision was first made for the amounts required to fill new crude pipelines and for higher working stocks corresponding to higher levels of operations. These estimates were based on a study made by the Economics Advisory Committee to the Interstate Oil Compact Commission.

"Crude runs to stills, based on above crude availability, are estimated in Table III.

"The estimated average crude runs to stills for the calendar year 1948 of 5,482,000 barrels daily represent an increase of eight percent over 1947, peak postwar year; 16.4 percent over 1945, peak war year; and 42 percent over 1941, peak prewar year.

Table III

	1948 2nd Q	1948 3rd Q	1948 4th Q	1949 1st Q	Average 12 Mos.
	Thousand Barrels Daily				
Crude run to still	5,452	5,498	5,607	5,652	5,552
Actual crude runs previous year	4,925	5,268	5,298	5,370	5,216
Increase %	10.7	4.4	5.8	5.3	6.4

"After taking into account the above conditions and estimates, the supply available for domestic demand is 6,025,000 barrels daily, average, for the coming summer-winter period. This indicated 'availability', qualified later in the report, is 445,000 barrels daily (8.0 percent) above the demand in the previous summer-winter period. For comparison, the increase in past summer-winter period (which included an unusually severe winter) over the previous one (which included an unusually mild winter) was 510,000 barrels daily.

"There is considerable flexibility in refining operations so that this increase could be divided in various ways between individual products, within limits. One principal limitation is the minimum amount of residual fuel (and therefore maximum amount of all other products) which can be obtained from refinery operations. There has been a trend toward lower residual fuel yields and higher yields of other products in the past few years. With the announced installation of new refining equipment capable of obtaining much higher yields of products other than residual fuel, this trend could continue and thus may make available a somewhat higher rate of increase for products other than residual fuel oil.

"Even though a breakdown in supply was avoided during the past winter, the race between unprecedented demand and record-breaking supply was so close that some spot shortages were unavoidable. It was found impossible in some instances to have the right amount of the right product at the right place at exactly the time needed. This past experience indicates that distribution problems become apparent whenever demand reaches 95 or 96 percent of maximum supply capacity.

"It is your subcommittee's opinion that the industry will be able to meet an increase of four to five percent in demand during the coming summer-winter period without resorting to the various distribution expedients used last year. In the past the normal increase in demand has been about four or five percent. A greater increase may result in spot shortages, company allocations and the need for aid from and in-

Table I

Estimated U. S. Supply and Availability for Demand
(Thousand Barrels Daily)

	1948 2nd Qtr.	1948 3rd Qtr.	1948 4th Qtr.	1949 1st Qtr.	12 Months Average 4/1/48-3/31/49	Change from Comparable period in Previous Year %
SUPPLY						
Crude Production	5,450	5,505	5,555	5,600	5,528	+ 5.9
Natural Gasoline, Etc.	394	402	416	421	408	+ 8.8
*Imports—Crude	291	315	315	315	309	+15.7
—Products	171	163	185	185	176	+ 4.8
Total Supply	6,306	6,385	6,471	6,521	6,421	+ 6.5
Change from Comparable Period in Previous Year %	+ 8.5	+ 7.4	+ 5.2	+ 5.0		
STOCK CHANGE						
Crude	+ 17	+ 17	+ 17	—	+13	
Products	No change assumed between estimated levels of 3/31/48 and 3/31/49					
Total					+13	
AVAILABLE FOR DEMAND						
Domestic					6,025X	+ 8.0X
*Exports—Crude	132	141	103	104	120	— 6.3
—Products	275	305	267	204	263	—10.5
Total Demand					6,408	+ 6.8
RUNS TO STILLS						
Change from comparable period in previous year %	5,452 +10.7	5,498 +4.4	5,607 +5.8	5,652 +5.3	5,552	+ 6.4

* Estimated by U. S. Bureau of Mines

X This "availability" is before provision for any improvement in product stock working levels. If actual demand averages this amount, distribution difficulties similar to those in the previous year could be expected.

Table II

Detail of Estimated U. S. Supply Factors
(Thousand Barrels Daily)

	Domestic Crude Production	Natural Gasoline Condensates and Benzol	Imports Total	Imports Crude	Imports Prod.	Total New Supply	Exports Crude	Exports Prod.	Domestic Availability	Stock Change	Net Domestic Consumed	Crude Run To Stills
12 Month Period 3/31/47	4,802	329	5,131	249	157	5,537	119	301	5,117	+47	5,070	4,787
Calendar Year 1947	5,085	364	5,449	267	170	5,886	127	324	5,435	—14	5,449	5,075
Calendar Year 1948	5,463	402	5,865	300	178	6,343	120	263	5,960	+61	5,899*	5,482
12 Month Period 3/31/48	5,219	375	5,594	267	168	6,029	128	294	5,607	+27	5,580	5,216
12 Month Period 3/31/49	5,528	408	5,936	309	176	6,421	120	263	6,038	+13	6,025*	5,552

* Available for consumption domestically—See note on Table I

dividual company cooperation with state and local fuel oil coordinators in varying degrees depending on the demand. If the demand increase in any one product exceeds four to five percent, distribution difficulties may be encountered, if the demand increase in other products is not correspondingly less."

Accompanying the report were tables (I-II) giving details of supply and availability by quarterly periods and by districts. Members of the sub-committee preparing the report were: H. W. Page, chairman, John W. Boatwright, Austin Cadle, J. E. Dyer, R. J. Gonzalez, Edward T. Knight, Albert J. McIntosh and Fred Van Covern.

A report prepared by the Economics Advisory Committee of the Interstate Oil Compact Commission estimates daily requirements of all oils for the twelve months ending March 31, 1949, at 6,390,000 barrels daily including domestic demand of 5,997,000 barrels and export demand of 393,000 barrels. Imports are estimated at roundly 500,000 barrels daily. The committee gives the figure of 5,960,000 barrels daily as the required domestic production of crude oil and natural gas liquids in order to provide for domestic consumption and to add 75,000 barrels daily to stocks. This addition to stocks, amounting to approximately 28,000,000 barrels for the year, is essential in the committee's opinion, in view of the increase in demand which is estimated to require 6,050,000 barrels daily for the first quarter of 1949.

Comparison of the forecasts of the two committees reveals that they are in rather close agreement, the estimate of the Economics Advisory Committee being slightly higher in its totals. In its report that committee undertook to calculate the demand for petroleum products as shown in the following table:

	Year Ending 3/31/48	Year Ending 3/31/49	Change Quantity	Change Percent
	Thousands of Barrels Daily			
Gasoline	2,333	2,480	147	6.3
Kerosene	314	345	31	9.9
Distillate fuel oils	946	1,070	124	13.1
Residual fuel oils	1,455	1,480	25	1.7
Other products	958	1,015	57	6.0
Total	6,006	6,390	384	6.4
Domestic demand	5,583	5,997	414	7.4
Export demand	423	393	—30	—7.1

These two committees, including men who are familiar both with the overall picture and with conditions in every part of the country, are in virtual agreement that it is within the ability of the domestic industry with imports reasonably available to meet the requirements of consumers within the United States and to continue exports at over 90 percent of the 1947 level. The record of the industry during the first five months of 1948 in maintaining a constant rise in crude production and runs to stills gives practical support to this opinion.

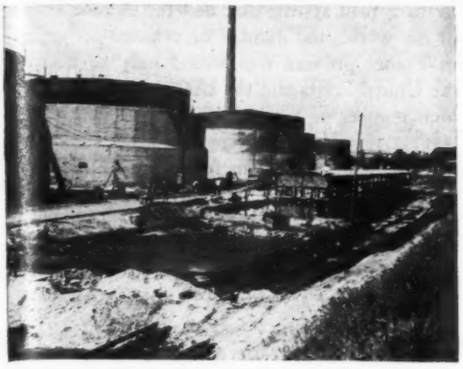
Navy's Savings On Mid-East Oil

Following publication of the Senate War Investigating Committee (Brewster committee) report containing allegations that the United States Navy had been overcharged to the extent of $30,000,000 on purchases from Arabian American Oil Company, the Secretary of the Navy on April 28 gave out a statement showing that in reality more than that amount had been saved on purchases of Persian Gulf oil for Navy use as compared with the same quantities had they been bought at Gulf Coast or Caribbean ports. The statement in part is as follows:

"I wish to make it clear that the Navy never received in 1941 or at any other time any unconditional offer for the sale of oil at 40 cents a barrel from the Middle East. The alleged offer of 40 cents a barrel was expressly conditioned upon an advance of $30,000,000 being made to the King of Saudi Arabia, to which neither the Navy nor any other agency of the government was authorized to commit itself.

"The Navy first paid $1.05 for oil in October 1945 and will continue to purchase oil at this price from the Middle East until July of this year. During this time 43,000,000 barrels of Navy special fuel oil will have been purchased for $45,150,000. The average price for similar products from the U. S. Gulf Coast and Aruba during this same period has been $1.84 per barrel. It is apparent, therefore, that its purchases from Middle Eastern sources have cost the Navy $33,000,000 less than would have been the case had its petroleum purchases all been made at Gulf Coast and Aruba prices. In addition the purchase of oil from Arabian sources has effected considerable savings in transportation costs.

"The Brewster committee criticizes the fact that the $1.05 price was increased for the procurement that was made for the last half of 1948. The negotiations for this contract were protracted. The prices agreed to were $1.17½ per barrel for the first three months of the contract and $1.48 per barrel for the second half of the contract. The average price for the six months is $1.32 per barrel. This is an increase of approximately 25 percent from the $1.05 price. In contrast to this increase of 25 percent, the price in the Gulf Coast and Aruba for comparable products has increased from $1.05 in October 1945 to $2.63 or approximately 150 percent. In other words, the Navy is now buying oil in the Middle East at less than one-half the price oil is selling for at the Gulf Coast and Aruba.



Tanks being repaired at Petit-Couronne Refinery. Photo courtesy Shell Oil Co.

FRANCE SURVEYS OIL NEEDS UNDER ERP

By Harry M. Ballande

Secretaire General de la Chambre Syndicale des Raffineurs de Petrole

IN these pages several months ago* the writer sketched the needs of France for petroleum products as they were set out in the Monnet Plan for the period 1947-1955. This plan contemplated a continuous increase until, at the end of the period, the consumption of oil products would be double that of 1938. The provisions of the plan were drawn up with a view to covering the power needs of France and to assure the restoration of agriculture and transport in a country that is progressively regaining its former prosperity.

Long before completion of the first year of the reconstruction plan, it was possible to see that the scarcity of prime materials, the difficulties of financing and, to a lesser degree, the insufficiency of equipment would markedly slow down the realization of the plan.

In the middle of 1947 when the petroleum industry was added to the list of basic activities, the others being coal, electricity, metallurgy, cement, mechanization of agriculture and transport, petroleum was accorded only 51,000 tons of steel out of the French 1947 production, which was less than half of its estimated need of 123,000 tons. The refining industry which had asked for 70,000 tons received only 22,000. At the same time the project of buying 30,000 tons of steel from the United States for construction of tanks was reduced to 1,600 tons on account of dollar shortage.

On the other hand the scarcity of hard currency led to a withdrawal of all grants for the purchase of equipment; $9,330,000 had been adjudged necessary for this purpose. Of 350,000 pounds sterling requested for the same purpose, only 270,000 were accorded. Finally, the credits allowed by the government in 1947 for reconstruction were held to 4,620 millions of francs, which was hardly 16.7 percent of the damage suffered from the war.

By the middle of last year it clearly appeared that not only the economic restoration of France but its existence was at stake. In a summer that was the driest experienced in a long time, following an exceptionally severe winter, the grain and feed crops hardly reached half their normal size. Deliveries of coal from the Ruhr and the Saar were disappointing and could not make up for the drop in imports from Britain. Hard currency credits and the gold reserve being almost exhausted, the plan for imports had to be reduced to provide for certain vital items such as wheat, coal, fats, fertilizer and other essential products. At the same time the means of payment for purchases were circumscribed by a marked falling off of export of French manufactured goods, due to the high domestic prices that were the result of an aggravated inflation. Credits for purchase of crude in the second half of 1947 were scaled from $33,830,000 to $23,785,000, and for refined products from $39,547,000 to $18,177,000 for France and North Africa, a total average decrease of 42.8 percent. The result was a dangerous decrease in stocks (see graph), and from September on severe restrictive measures had to be put back in operation.

As regards automotive gasoline, abolition of the basic ration (5.3 gallons a month,) and a mass reduction in the categories of priority users brought consumption to 45 percent of its prewar level, in spite of the fact that actual needs had increased considerably due to the growing number of trucks and agricultural tractors as well as reconstruction works. Ration coupons for gas-oil and kerosene, which had been suppressed a year earlier, were reestablished and the gravity standards of distillates were raised.

These restrictions were kept in force under the administration of interim aid, from which France received $32,295,975, including freight, for purchases of petroleum products between Dec. 18,

Petit-Couronne refinery (1948) after repairs.

* World Petroleum, Annual Refinery Number, July, 1947.

1947, and March 31, 1948, amounting to 6,930,000 barrels of crude oil and 249,000 tons of refined products with a total value of $25,788,635 fob. refinery.

Taking into account the total of resources coming from the sterling zone and the dollar zone, the global tonnage of automotive gasoline put at the disposition of the civil economy in the course of these three months did not exceed 108 million gallons, a decrease of 25 percent in comparison with the corresponding period of 1947. It was only at the cost of heavy sacrifices that the consumption of gas-oil and fuels of primary importance in the reconstruction of the country was increased by 40 percent.

This recounting of the difficulties presently experienced by the French economy makes it possible to understand the interest that has been aroused by the project of European cooperation and the friendly aid of the United States through the European Recovery Program, and the hopes that have been raised thereby.

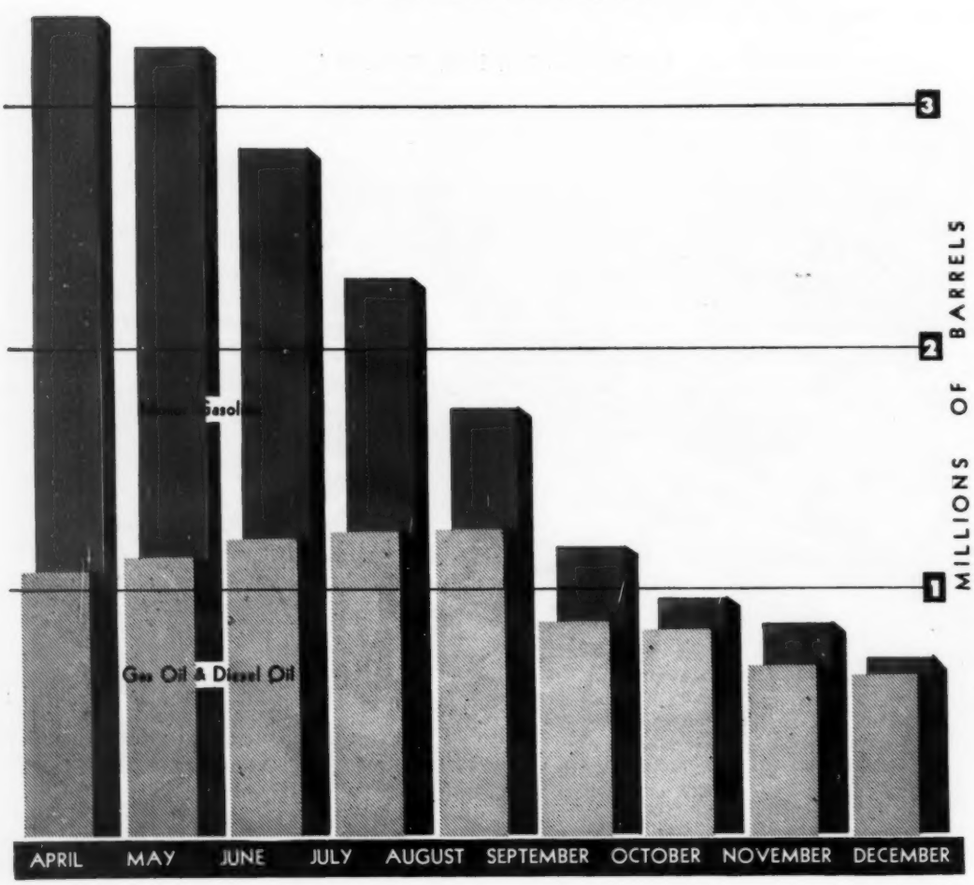
The requests presented by France within the framework of the ERP were taken from the Monnet Plan and revised in an effort to accelerate in every possible way the solution which petroleum could bring to the power problem and to eliminate from the Monnet Plan everything that was not of absolute necessity.

For this double reason it has been provided that the consumption of petroleum products will be raised by 1951 to 106,500,000 barrels, which is close to the figure of the Monnet Plan for 1955, but this rapid increase will be limited essentially to fuel oils. It may appear surprising that it is contemplated to raise the consumption of this product from two million tons (1947) to 7.5 millions in 1951, as there appears reason to expect a world shortage during that period.

It should be kept in view, however, that satisfaction of the power needs of French industry will determine the rapidity of its recovery, which should reach about 40 percent in the four coming years in order to reestablish economic equilibrium and a balance of accounts. The part played during this period by the growth of hydroelectric power, the development of which is more costly and slower than of fuel-heat, will not be very great.

Under the necessity of resorting to imports for complementing its power resources, it is natural that France should turn to fuel oil for those uses in which it has shown itself definitely superior to coal. It is not a question of converting from coal to fuel oil on the ground of comfort and ease of operation, but for the satisfaction of a vital need. The number of installations now existing in France does not exceed 33,000, of which 16,000 are in bakeries and only 13,200 in use for domestic heating. The number of oil burners in service increased only 17 percent in 1947, compared with 27 percent in the United States in the same period.

Reduction of French stocks during 1947.



With a road system that had the densest traffic in the world, the number of vehicles per capita in France pre-war was second only to that of the United States and the United Kingdom. The total number of trucks (450,000, of which 25,000 had diesel motors) remained about stationary on account of regulations for the coordination of transport which prevented further development, while the number of light vehicles (1,080,000) progressively increased. Hard hit by the war, the latter now amount to about a million, of which many are aged and in bad condition, while commercial units increased to 550,000 vehicles, of which a third can carry two or more tons.

In view of the previously mentioned directives, which, during the period of the development of ERP, require the elimination of everything not absolutely indispensable to the recovery of the country, the plan for 1951 will keep the number of light vehicles at about 1,200,000, and these for the most part will be for essential uses; on the other hand, there will be a marked increase in the number of trucks, which will increase to 660,000 in 1950 and to 700,000 in 1951.

On these bases the consumption of gasoline for road transport will not exceed 900 million gallons in 1950 and 960 million in 1951, which will be an increase of only 10 and 15 percent in comparison with 1938. It is still possible that this consumption, of which only four percent is due to non-essential vehicles, will continue to be subjected to a certain amount of restriction.

On the other hand agricultural consumption will experience a rapid increase, due to the development of agricultural machinery without which the food problem of France can hardly be solved. The schedule for the use of agricultural petroleum fuel is shown in the table below:

	Number in Thousands		
	End '47	End '48	End '49
Gasoline tractors	36	50	70
Mixed gaso-kerosene tractors	13	18	25
Diesel tractors	16	28	50
Totals	65	96	145

The number of stationary and semi-stationary motors in agricultural enterprises will be appreciably increased during the same period and will rise from about 200,000 to about 270,000.

These figures represent for France in 1951 a consumption of 106,500,000 barrels and for its overseas territories 26,270,000 barrels, hardly double those for 1938, whereas the coefficients of increase contemplated by the Economic European Cooperation Committee are not less than 2.5 for Great Britain, 2.0 for Italy, 2.8 for Sweden, 2.6 for Denmark and 2.4 for Belgium. The corresponding consumptions per capita are 270 kilograms for France against 542 in Great Britain, 520 in Sweden and 554 in Denmark.

It may be remarked that if the prewar consumption trend in France had continued through the critical period of hostilities and in the liberation, the consumption would amount to at least 74 million barrels in 1948 and 85 million in 1949. The increase would appear greater if, as was done in a recent official study, the consumption

in 1947 were taken as the base for calculation. But it should not be forgotten that for France 1947 was an exceptional year on account of the abnormal obligation to buy great quantities of wheat and coal, which hampered the otherwise prudent plan and forced a fruitless effort to recover economic equilibrium.

The realization of this program will encounter difficulties, the principal of which will be the world shortage of petroleum products and the inadequacy of the refining industry and marine transport.

As regards the first point, it is to be hoped that the relatively modest needs of the French market, which is looking more and more to the Middle East, will be covered without difficulty by the groups engaged in refining in France. About 75 to 80 percent of these needs are centered on crude petroleum, concerning which a recent report of the Petroleum Council gives assurance that there will be no shortage in the next few years. The ERP for France provides a reasonable opportunity for exploration and drilling. The insufficiency of world refining capacity will imply a parallel development of the French refining industry, which will likewise be oriented toward a predominance of fuel oils. Fortunately this double condition may be realized by relatively economical installations wherein simple topping will play the major role. For this reason the stepped-up plan for the French refineries contemplates making as large a use as possible of the industrial resources of the 16 nations of western Europe, which represents less than 15 percent of the aid which these latter expect from the United States for this petroleum equipment and that of their overseas territories.

At the cost of a considerable effort, which will make evident the vitality of the French industry and what it will be able to do if this aid is forthcoming, the reconstruction of refineries has made substantial progress in spite of the steel shortage; whereas at the beginning of 1945 their effective capacity did not exceed 39,000 barrels daily, it now amounts to 162,000 barrels, which is 94 percent of the prewar figure. Thus, even before the first equipment requested from the ERP is put in service, the French refineries will be able to treat an average of 200,000 barrels a day during the fiscal year of 1949. By its own efforts France, therefore will find itself a year ahead of the estimates of the European Economic Cooperation Committee and will furnish a not negligible contribution toward satisfaction of world demand for refined products. It should be remarked, however, that these results are due especially to the generalization of simplified refining methods. The estimates for processing in the following years cannot be reached without external aid. These increase regularly from 253,000 barrels a day (fiscal 1950) to 300,000 barrels a day (fiscal 1951) and 345,000 barrels (fiscal 1952).

It must be admitted that the tanker shortage poses a difficult problem, the solution of which must be sought from ERP itself, from intensified effort in the shipyards and a stepping-up of the building of the great pipelines, which should bring the rich fields of the Middle East closer to Europe. However, the needs of France in this respect are already covered for the next few years to a large extent—95 percent for the last eight months of 1948 and 80 percent in 1949.

The requests of France from the ERP have in view a definite solution of the industrial problem and refer to a modest proportion of petroleum, because only the ERP is in a position to furnish on short notice a supply of indispensable power with a minimum use of steel and labor.

These projects correspond reasonably and realistically to a matter that has vital importance for the economy and recovery of France. Only the difficulties of payment in exchange can offer an obstacle to their realization.

Stocks of Gasoline and Distillates

Last Half of 1947
(At refineries, terminals and depots)

End of Month	Motor Gasoline	Gas Oil & Diesel Fuel
April	3,370,000	1,090,000
May	3,245,000	1,142,000
June	2,825,000	1,215,000
July	2,295,000	1,240,000
August	1,752,000	1,260,000
September	1,185,000	880,000
October	968,000	828,000
November	855,000	698,000
December	705,000	650,000

Four Big Tankers for Texaco

Four oil tankers which will be among the largest in the world are being built for The Texas Company by Bethlehem Steel Company, shipbuilding division, Quincy, Mass. The keel for the first ship will be laid early this summer, and the first vessel will be in service about July, 1949. The other three will follow shortly thereafter. These four tankers, each of large capacity, will be used in crude oil service and probably will move required crude oil into the United States from foreign fields. Particulars of the vessels are as follows: Length, 623 feet overall, 595 feet between perpendiculars; beam, 84 feet; depth (moulded), 44 feet; draft, loaded, 33 feet; displacement, 36,250 tons; deadweight, 28,000 tons; capacity 240,000 barrels or 10,080,000 gallons; speed —trial, 16¾ knots, service, 16 knots; power, 12,500 HP; engine, double reduction geared steam turbine; propulsion, single screw.

First Quarter Steel Shipments

Shipments of steel products from United States mills during the first quarter of 1948, according to statistics compiled by the American Iron and Steel Institute, amounted to approximately 16,438,000 tons. Pipe and tube shipments exceeded 1,670,800 tons. Sheet and strip shipments were about 4,848,200 tons. Shipments of bars totaled 2,875,000 tons. All operations were at a higher rate than in the peak war year, 1944. Continuation through the year of the same volume of tubular goods movement would have surpassed the high record of slightly over 6,000,000 tons established in 1947.

Production during the second quarter will fall somewhat below the total for the first three months because of the interruption of mill operations by the coal strike. By the second week of May, however, mills were again running at 94.3 percent of capacity.

Navy Buys Federal Shipbuilding

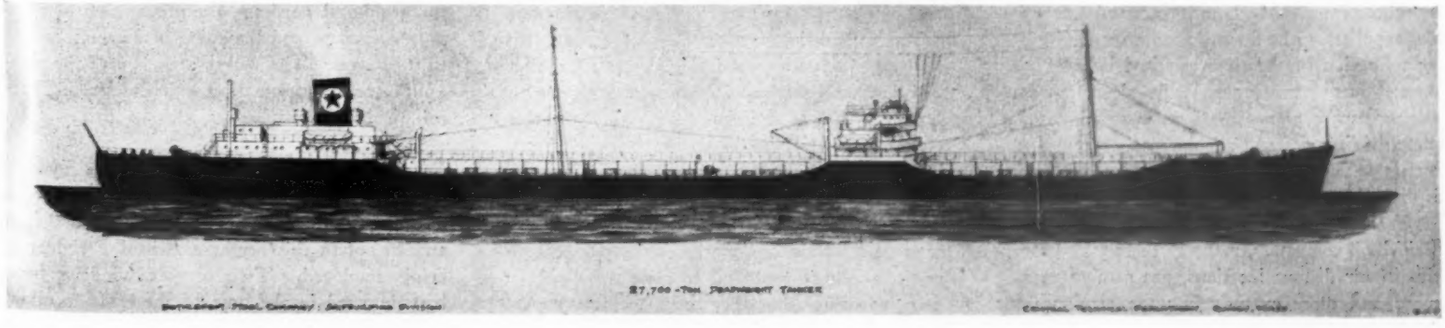
Purchase by the United States Navy of the Federal Shipbuilding and Dry Dock Company's yard and construction facilities at Kearney, New Jersey, has been confirmed by L. H. Korndorff, president of the Federal Company. The sale price is stated as approximately $2,375,000, representing the depreciated book value of the physical assets.

Federal Shipbuilding and Dry Dock Company was organized by the United States Steel Corporation in 1917, during World War I, at the request of the government, and much of its construction work has been done for the Navy. Between the two wars, however, it built many commercial vessels including large passenger liners, cargo ships and tankers. Upon the outbreak of World War II its facilities were again absorbed by Naval requirements, and it became the leading yard for the building of destroyers. Transfer of the property to the Navy will take place upon completion of the work now in process.

Work Boats for Creole

Creole Petroleum Corporation is building two 65-foot all-purpose work boats. These boats are for use in Lake Maracaibo, Venezuela. They will be powered by two series 6-71 General Motors diesel engines, connected through a reduction gear to a single propeller each. This is a new design of boat.

Architect's drawing of new Texaco Tankers.



BRITISH OIL COMPANIES FIND WIDENING USE FOR AIRPLANES

An Anglo-Iranian Oil Co. plane at Kermanshah.

London

IF the Wright Brotherse had not captured the secret of aerial flight forty years ago, some member of the oil industry would have had to invent the airplane long before this time. Such is one man's summation of the important part that aviation has come to play in oil company operations. Probably no other industry has discovered a wider variety of chores for planes to perform or has found them of greater usefulness in its ordinary activities. Aside from their convenience in making possible the prompt movement of personnel, they have come to be an accepted factor in all sorts of field activities. Aerial photography and magnetometric survey are a recognized part of preliminary exploration. A single flier can inspect a thousand miles of pipeline in a week at a quarter of the cost of line walkers. The handy helicopter can maintain communication with field parties in areas difficult to traverse by other means. Machine replacements or essential supplies can be flown in from great distances in a fraction of the time required by any other means, thus preventing expensive work stoppages. Big transport planes even serve to move complete drilling rigs and all kinds of structural materials to locations where surface transportation is difficult or entirely lacking.

British oil companies, many of them with properties in far distant locations, are coming to rely more and more extensively upon airplanes for speed and economy in certain phases of their operations. Back in 1912 the late Mr. Ritchie, then field manager of the Anglo-Persian (now Anglo-Iranian) Oil Company, conceived the idea of utilizing the airplane for his own transport in his field work. While home on leave he purchased a plane, had it disassembled for shipment and rebuilt it in Persia. He flew it on a few short journeys, then crashed and wrecked the plane. So far as the records show, he was the pioneer among Britons in the adaptation of air transport to petroleum operations. While his experiment was not entirely successful, it has not prevented the wide expansion of aerial service by oil companies in more recent years.

In 1928 Anglo-Iranian inaugurated an air service in Iran which has been in continuous operation ever since. Its headquarters are at Abadan where hangars and repair shops are maintained. At present the company has eight aircraft in regular operation including six DeHaviland "Rapides" seating five to six persons, and two "Doves," each accommodating eleven. A staff of 23 pilots and engineers operate and service the fleet. Each plane is equipped with two-way Marconi wireless sets but is operated without radio control. Landing grounds are located at divisional points and in the various fields. Some of the latter consist merely of strips of hard sand with boundaries marked by empty oil cans and a guiding line of oil to enable the pilot to keep his course, but they serve their purpose.

Company planes are used largely in routine service between headquarters and points at which active operations are being conducted. Time-saving trips to outlying fields and refineries are made by staff and management; cases of sickness requiring urgent medical aid are either flown to base or hospital for treatment or the doctor and nurses are transported to the patient; replacements of materials in cases of breakdown are transported; new plant is taken to sites where terrestrial transport would be slow and difficult. Aerial survey of prospective or producing territory is now a routine part of the petroleum geologist's duties.

In 1946-47 Huntings Airsurveys, Ltd., made a comprehensive survey of company properties in Iran using a DeHaviland Rapides adapted to carrying cameras—a Williamson Eagle IX for vertical shots and an F-24 type for obliques. Over 4,200 square miles of territory was photographed for geological purposes, the preparation of topographical maps and the siting of communications in field areas. The survey also covered the planning of refinery expansion and new housing sites on Abadan Island.

Further surveys for geological purposes covering some 10,000 square miles are now in progress. Most of the flying has to be done at 22,000 feet, and to obtain this height a Bristol Freighter is being employed. Two perspex windows have been inserted in the nose of the craft to allow

clear forward and downward vision for photography. The expedition consists of nine members under the leadership of Captain Warwick as chief pilot and Flt.-L. Hutchinson as photographic manager. The size of the plane enabled members of the party and most of their equipment to travel in it from England to Iran.

Prior to the war, in 1938-39, Anglo-Iranian made an aerial survey of Papua in New Guinea covering 28,000 square miles. The survey was directed by Dr. Lees, head geologist of the company, with a staff of seven geologists and six draftsmen using a Douglas-Dolphin amphibian furnished by Fairchild Aerial Surveys. During the past year the company has participated with other concession holders in the survey by airborne magnetometer of the Bahamas and surrounding waters.

Iraq Petroleum Company, Ltd., operates a fleet of twelve airplanes, nine DeHavilands and three Doves, in the territory included in its field and pipeline operations in Iraq, Palestine and Syria. Its air service is under the management of Airwork, Ltd., which does a large amount of work for oil comanies. The planes are employed mainly in the transportation of personnel and supplies and carry an average of 1,500 passengers per month.

Recently a Bristol Freighter made a demonstration flight of 18,000 miles to Iraq and Iran carrying among other cargo a tank weighting 8,500 pounds, the takeoff with this load being accomplished on one engine. It also carried drilling equipment to and from oil well sites.

In India and Burma aerial photography was employed by the Burmah Oil Company, Ltd., as far back as 1934, and in 1937 a comprehensive aerial survey was begun in behalf of the company by India Airsurvey and Transport Company. The survey covered several thousand square miles comprising practically the whole of the tertiary area of those countries. Since the end of the war work has been resumed by Indian National Airways and is expected to provide better knowledge of the geology of Burma, India and Pakistan. Part of the work that has been done was conducted in conjunction with the Indo-Burma Oil Company and Attock Oil Company. In districts heavily covered by jungle this aerial method has reduced the time required for mapping by ground crews from months to weeks, while in desert areas or those sparsely covered with vegetation, the time element has shrunk from months to days.

British companies with holdings in South America have found airplanes particularly helpful not only in survey work but also in overcoming physical barriers in the movement of men and supplies. In Venezuela Shell maintains a number of planes primarily for the use of staff members in moving from one location to another. These include three Lockheed 12-A twin-engined planes carrying six passengers, a single-engined Fairchild three-seater and a Stinson with single engine and space for two. These planes ordinarily carry only food and mail in addition to their passengers, but in an emergency they can be converted into ambulances or can handle freight that is not too bulky.

Recently the company purchased a supermarine Sea Otter amphibian flying boat built by Vickers-Armstrong, which was shipped from England on January 10. It is intended for use servicing survey parties in swamp areas. This is a development of the famous supermarine Sea Walrus, an air-sea rescue boat which was in production during the war and has since been used in adapted form by Antarctic whaling expeditions. The Sea Otter is powered by an 855 HP Bristol Mercury engine, seats five persons, has a cruising speed of 100 miles per hour and carries a load of 2,-120 pounds.

In 1946 aerial photographic surveys were carried out in western Venezuela by the Aero Service Corporation and in eastern Venezuela by Fairchild Aerial Surveys, Inc., acting for all the oil companies interested. In the following year further work was carried on by Photographic Survey Company, a Hunting subsidiary. As a result of these operations, maps of most of the Maracaibo Basin, parts of the states of Apure and Barinas and a large portion of northeastern Venezuela became available for photogeological study.

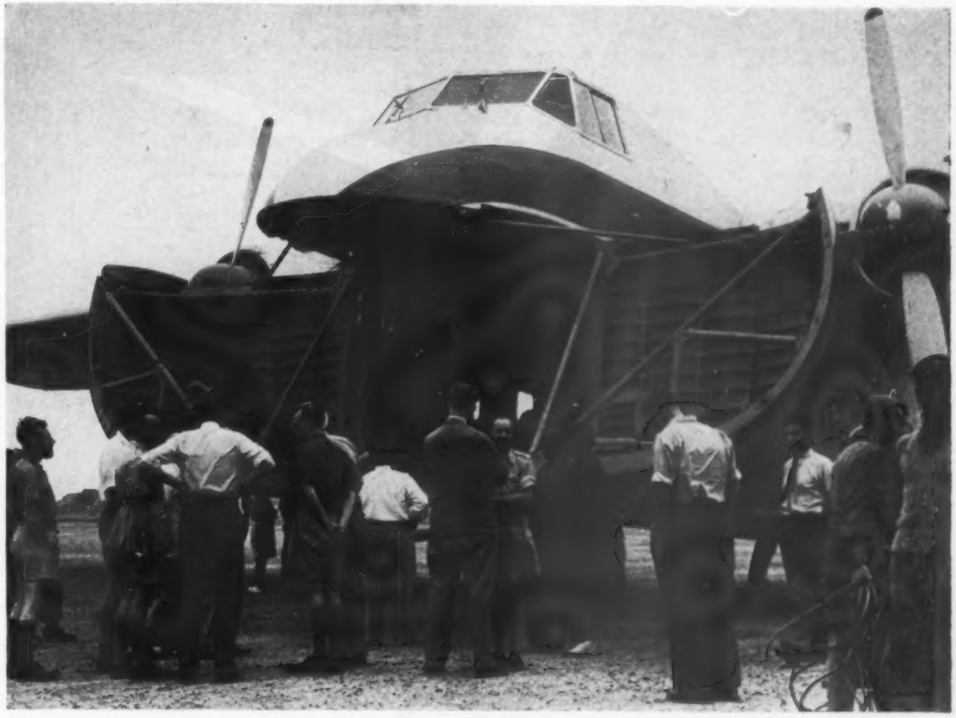
When Shell commenced exploration in the Oriente of Ecuador (the region east of the Andes,) it was found that to get the exploration parties to the survey sites, the only satisfactory means of transport was by air; the whole of the Oriente being made up of dense jungle, land transportation was ruled out. The high peaks of the Andes, and the risks of passes closing in low cloud add to the hazards of any form of transport. The first consideration, therefore, was to build landing strips in this jungle.

A base airstrip was established at Shell-Mera, 200 miles southeast of Quito, and from there by means of parachuting men, materials, tractors and other equipment, three airstrips were hacked out of the jungle at Arajune, Ayuy and Taisha. These were very primitive strips, with rubble surfacing and limited in length in the early days to less than 700 yards. This restricted their use to planes capable of landing and taking off under such adverse conditions; twin-engined Budds and trimotor Fords were the original types of aircraft employed. These planes put in an immense amount of work in the early days in transporting men and materials to the prospective drilling sites.

A Grumman Goose amphibian was used prior to the building of airstrips for conveying material to new sites, for the transport of seismic and other parties, as well as for river survey work. Today the aircraft position is somewhat changed with better and longer airstrips.

The present air staff, supplied by Airwork, Ltd., consists of seven pilots, nine European overseers and 30 workmen. The planes in use are two Bristol Freighters, two Douglas C47's (Dakotas), three Grumman Goose amphibians and two Ford trimotors. The two Dakotas are ex U. S. Army Air Force planes and are in excellent condition. They are used for parachuting operations, transporting tractor parts, food and gasoline. Live sheep and pigs are regularly parachuted to the working parties. At present they are mainly engaged in this work in connection with the construction of a fourth airstrip at Triputini on the borders of Ecuador and Peru. Although this airstrip is only 600 yards in length and completely surrounded by high jungle, Dakotas have already landed on it.

Bristol freighter open for unloading in the Middle East.



First use of a plane for transportation in the Iranian fields was in 1912 by the late Mr. Ritchie, then field manager for Anglo-Iranian (then Anglo Persian). The two photographs show the Ritchie plane after a crash.

An Anglo-Iranian plane at the Masjid-i-Suliaman air field. ↓

The Bristol Freighters are being used mainly for the transportation of heavy drilling equipment, caterpillar tractors, LeTourneau scrapers, drill collars and casing, bits, trucks, jeeps and sheep's foot rollers. In 40 flying days, one of these aircraft carried a total of 844,228 pounds of freight, despite the loss of time incurred by employing local labor in loading. They have recently successfully transported the largest piece of equipment carried by an aircraft in Ecuador; it was an Emsco J1000 Rig, weighing 7,300 pounds, measuring 18 feet in length, with a height of six feet eight inches and a width of six feet three inches.

It was thought originally that it would be impossible to load, but a prototype in wood was first built to determine the feasibility of this operation; when it was found possible, the load was run into the hold on steel rollers. When in position there was only an inch clearance at the rear of the fusilage roof. It is estimated that this one operation saved the oil company $15.000.

Another noteworthy operation was carried out in August last when a 5,500-pound Schlumberger winch, picked up at Salinas on the western side of the Andes, was transported to Shell-Mera. The first attempt on this work was foiled by bad weather, but the crossing was finally made at a height of 20 400 feet, carrying 12 passengers and accessories for the winch in addition.

The Freighters have also been used in parachute operations, and for this purpose the rear entrance door is removed before the take-off. Traveling at little more than 100 miles per hour at 150 feet, the aircraft dropped petrol, dynamite, food and mail to an exploration party in a small clearing where they were camping out, 70 miles in the jungle.

All aircraft in Ecuador carry shotguns and supplies of food in case of an emergency landing, since almost all flying operations are carried out in dense jungle.

Photographic flights over the Oriente section of Ecuador were made for Shell by Fairchild Aerial Surveys just prior to the war and again in 1945.

Similar work was conducted over part of the Montana of Peru in 1946 and 1947. In all these areas aerial photography is practicable only during the dry season and even then is restricted to occasional days or hours by the presence of clouds or of haze due to fires.

In Colombia photogeological surveys are being made by Aerofotos, Ltda., a subsidiary of the Hunting group, of portions of the Atlantic coast area. Similar work was carried on in 1947 in the Llanos and the Magdalena Valley.

A modern invention that facilitates air survey work is the Decca Navigator. Basically this comprises three elements: a minimum of three ground transmitters, a receiver carried in the aircraft and a series of special maps.

The three ground stations radiate continuous wave signals of long wavelength, which interact to form two hyperbolic space-patterns of stationary waves. The two space-patterns intersect and form a two-coordinate grid; the function of the receiver is to detect the patterns and automatically to indicate the values of the two coordinates at the point where the receiver is located. Thus, by reference to a map on which the hyperbolic grid is displayed, an observer at the receiver can fix his position with respect to the ground stations.

The values of the coordinates are indicated directly, by means of a pair of dials with scales numbered in a manner corresponding to the numbering of the grid-lines on the map. In taking a fix the observer has only to transfer the dial readings to the map, his position being given by the intersection of the two coordinates. As the journey proceeds, the dials automatically respond to all changes in the values of the coordinates, thus giving the facility of continuous position-fixing.

The rapidity with which the dial readings can be translated into plotted points on a map is of particular value from the air survey standpoint and is the basis of a recently-developed method of controlling an aircraft flying predetermined straight and parallel survey tracks. The technique consists essentially of plotting fixes every few seconds on a large-scale lattice map on which the desired flight lines are drawn, and passing course-corrections to the pilot if the plotted track diverges from the predetermined line. By this process the aircraft can be held within limits of plus and minus 200 yards from the wanted track with a high degree of reliability. Tracks of any orientation and spacing can be flown, irrespective of the configuration of the hyperbolic grid.

In practice not only the flight lines but also the turns between them and the approach from the base airfield are pre-drawn, enabling the whole operation to be rigidly controlled with a minimum waste of flying time.

The simplicity of the dial display and the absence of any calculation or manual operation in taking instrument-recording camera, synchronized with fixes are features that facilitate the use of an instrument-recording camera, synchronized with the shutter of a survey camera or coordinated with a magnetometer record.

Vickers-Armstrongs Ltd. "Sea Otter" used by Royal Dutch Shell in its operations in Venezuela.

Loading a 7,290-pound piece of oil field equipment for overseas plane shipment.

HIGH-MOLECULAR WAXES FROM CRUDE OIL

By Dr. Ernest Stossel*

THE valuable characteristics of high-melting-point microcrystalline waxes are being recognized more and more, and the continuing increase in demand has led to a very considerable expansion in their production. Costs have been substantially reduced and new important applications for these waxes have been found, as has been ably described in earlier articles appearing in WORLD PETROLEUM.

Raw materials for the production of high-melting waxes are available in large quantities as by-products from the dewaxing of lubricating oils and from the residues of crude oils. While crystalline paraffin waxes are obtained chiefly from petroleum distillates and their refining does not offer serious difficulties, high-melting waxes are produced mainly from residues and are associated in their crude state with other residual materials, such as asphaltic substances, resins and heavy oils, which limit their practical usefulness.

One of the most valuable characteristics of microcrystalline waxes is their oil-binding and oil-retention property. In order to furnish products usable for special applications, the waxes have to be freed from the residual heavy oils. This, however, cannot be achieved by distillation, sweating, centrifuging or similar processes now in use for the separation of oil from crystalline paraffin waxes. The separation is now usually effected in the presence of diluents, e.g., light naphtha, and especially diluents that have selective solvent properties such as a mixture of benzene and acetone, or methyl-ethyl-ketone. In a mixture of two selective solvents, one is chosen to decrease the solubility of the wax in the other solvent without materially impairing the solvent properties of the latter for the oils. In general higher separation temperatures and higher ratios of solvent to wax stock, or to petrolatum, raise the melting points and lower the penetration characteristics of the finished products. Most high melting point waxes are now produced by extraction process as by-products of the dewaxing of lubricating oils.

For about a decade waxes of very high melting points have been worked up on a commercial scale from tankbottoms. Depending on their origin, these precipitates show different compositions and wax contents and may vary in consistency from a mushy liquid to a hard solid wax.

* Dr. Stossel is associate manager of Paraphalt Argentina. He is a graduate of the University of Vienna where he specialized in oxidation of oils. He has worked in Texas on utilization of oil wastes and residues and has been accorded recognition by the War Production Board for his processes for manufacturing strategic chemicals, including microcrystalline waxes. He was the first to realize the importance of utilizing tank bottoms and crude oil residues for the synthesis of emulsifiable petroleum waxes by oxidation.

Ernest Stossel

The waxes with the highest melting points and highest molecular weights are the first to separate from their solution in the crude oil and to settle to the bottom of the tanks.

Most of the high-melting petroleum waxes offered to various industries are produced today from emulsions formed in tanks where crude oil has been stored, and these tank bottoms, which a few years ago were considered as waste materials, are valued nowadays in certain fields at a higher price than crude oil. Only a very small percentage of paraffins present in crude oil show melting points above 160°F, and a large volume of crude oil has to pass through the field tanks before an appreciable quantity of these waxes accumulate in the tanks.

The presence of water in the crude oil acts to increase the precipitation of the paraffin floc. As little as 0.2 percent water was found to produce a floc in a crude oil that contained 20 percent paraffin of 170° melting point, even though the oil was warm (90°F). The percentage of wax is, therefore, decidedly higher in the tank bottom settlings than in the de-stabiljzed crude oil. By the process of de-stabilization of emulsions, conditions at the water-oil interface are so altered that water particles will undergo coalescence on contact and can be separated from the crude oil by settling or centrifuging. Since mechanical, chemical or electrical methods are more and more widely used for dehydration of crude oils, the amount of available sediments will certainly decrease.

In order to separate the waxes in commercial practice, the crude oil emusion usually is freed from water and dirt by some suitable process such as settling, centrifuging or filtering. The clean bottoms are then reduced in a still to a residue having at least 500°F flashpoint by distilling off the lighter fractions; the asphaltic and resinous materials are removed by acid and clay treatment. This purified wax base stock still contains, however, heavy oils which cannot be separated from the wax by distillation. Solvent extraction processes similar to the orthodox methods used in de-oiling petrolatum waxes are applied.

More specific processes for working up tank bottoms based upon the fact that they occur in a form essentially different from wax stocks available in refineries have been urgently needed to reduce transportation costs from field to refinery. It appeared that such processes could be made attractive if materials of low value could be separated from the wax directly in the oil fields. To simplify the process and make it workable wherever deposits of paraffin and tank bottoms accumulate, those diluents available at the same location, such as crude oil or its components, should preferably be used. Furthermore, if use is made of petroleum fractions which could be applied at atmospheric pressure without appreciable losses, no specially constructed equipment would be needed.

With this object and in view of the fact that the demand for these waxes increased considerably during the last war while at the same time solvents and equipment became almost unavailable, a new process for producing bottom waxes more simply and economically was worked out and put into industrial use by the writer during the war, thus relieving substantially the shortage of microcrystalline waxes.

The separation of high-melting-point microcrystalline waxes from crude oil solutions in oil-free state is not to be compared with wax-separation processes by solvent extraction where solvents or carefully selected mixtures are used.

High-melting microcrystalline petroleum waxes separate from their solutions in polar solvents, (e.g., oxygen-containing or chlorinated solvents,) which are the most widely used ones in the processes of wax separation in microcrystalline form, and can be filtered with relative ease from the solution which also contains the heavy oils. On the other hand the waxes separated from cooled solutions in non-polar solvents (e.g. petroleum hydrocarbons,) are of a colloidal nature. The colloids which form part of these solutions are of the lyophilic type, and the stabilization of their colloidal solutions in hydrocarbons appears to be due to solvation of the colloidal particles. The combination of solvent molecules and the particles of the solution increases greatly the volume of the particles and also the viscosity of the solution. With increasing molecular weight and viscosity of the diluents, the separation of the colloidal waxes becomes impracticable.

Thus the difficulties of wax separation from non-polar solvents (crude oil consists of non-polar hydrocarbons,) are obvious. The use of hydrocarbon diluents in the known processes of wax

separation is, therefore, restricted to the members of the series with the lowest viscosities, or a non-solvent is added to the diluted solution in order to increase the sedimentation velocity. The solvation process is reversed by reducing the concentration of that solvent which has the greatest affinity for the wax particles, by adding to the mixture a liquid which is miscible with the good solvent but is itself a non-solvent for the wax.

Crude oils of high wax content congeal at normal winter temperatures or become so viscous that they present many difficult problems while they are being produced, transported and stored. High-melting-point waxes, although they are hardly soluble in cold crude oil, normally do not separate in an oil-free state directly from the crude.

The writer's method is based upon the observation that high-melting-point microcrystalline waxes can be brought to precipitate directly from crude oil or crude oil sediments rich in wax by first stabilizing the colloidal systems which are present in a mixed base crude oil.

In accordance with the description given in the writer's patents, the waxes can be separated industrially in a filterable form with low oil content, or oil-free, without the use of other diluents than fractions of crude oil itself, by first subjecting the crude oil to a thermal treatment at a temperature above that at which solvation of the high-melting-point waxes takes place.

The oil-insoluble asphaltic bodies are thereby brought to interact with the resins and microcrystalline waxes and, under certain conditions, remain in a state of colloidal dispersion in the oil, while the resinous materials and microcrystalline waxes act as protective colloids. Stabilization performed at high temperature remains effective at the lower temperature until the equilibrium is disturbed. The viscosity and pour point of these oils are temporarily changed by the stabilizing treatment, and the corresponding values will be considerably lowered and remain reduced during a certain time, after which they will return only slowly to their original values (pour-point hysteresis). The time required by the crude oil to return to its original characteristics depends on the composition of the oil, i.e., on the content of waxes, asphaltic and resinous ingredients, as well as on the content of light oils which are good solvents and the content of oils of higher viscosity which can be considered as anti-solvents for waxes at lower temeratures. It depends, furthermore, upon the conditions under which the treatment of the oil has been effected. It has now been found that there exists for each oil an optimum of hysteresis, i.e., the longest period during which the maximum of attainable reduction of pour point and viscosity persists before the original conditions are restored.

Based upon these considerations the new processes of separating high-melting-point microcrystalline waxes from crude oil consist mainly in stabilizing the colloidal systems, followed by mutual precipitation of the colloids by slow coagulation during the optimum period. A fractional precipitation may thus be achieved, and by controlling the conditions of cooling the crude oil, a precipitate is obtained which consists almost exclusively of high-melting-point waxes, asphalts and resins, while the heavy oils remain in solution.

The asphaltic constituents adsorbed on the surface of the wax particles reduce the tendency of the latter to increase their volume by absorption of oils, while the particles of asphaltenes, which agglomerate slowly, form nuclei for crystallization. Fine granules and aggregates are produced which form on the filter a porous cake, permeable to oils, and do not swell when washed by gasoline and may, therefore, be rendered oil-free.

The wax precipitated from crude oil contains all the petroleum insoluble asphalts and up to 20 percent resins and gums. The presence of these resins is probably due to their adsorption by the wax as it precipitates from the crude oil solutions. It amounts, however, only to a small proportion of the total resins and coloring bodies originally present in the crude oil. By far the greater part of these petroleum-soluble substances are separated in this process by the crude oil diluent. This fact proves a further advantage wherein the crude oil, or its residues, are reduced by distillation before extraction, and the wax base stock, therefore, contains all of the resinous and coloring bodies. Substantial savings in the cost of refining can thus be achieved. Comparative runs have shown a reduction in consumption of sulfuric acid from 5½ to two tons, and of clay from 12½ to six tons per 1,000 barrels of charge.

It is advantageous to remove asphaltic and coloring materials by acid treatment and percolation before distilling off the wash liquid. High-melting-point waxes, bleached to color and free from oil, can thus be obtained by this new process in a single distillation step.

The process of selective precipitation of high-melting waxes from crude oil without the use of solvents was originally worked out in an emergency. It proved to be one of the most efficient and economical methods of dewaxing raw materials which contain these waxes associated with varying amounts of crude oils such as tank bottoms, pipe and rod-waxes and similar residues from the production of crude oils. These materials are cheap and available in great quantities and are a potential source of the hydrocarbons with the highest molecular weight present in crude oil.

When the wax has to be separated in its crude form near the location where paraffin deposits occur, even cold settling may be applied successfully. The crude oil, after having been dewaxed in a continuous process, may be then "run" with the pipeline oil and the crude wax shipped for further processing by the wax refinery.

Incidentally it has been found that these crude waxes separated in the above described manner from crude oil containing asphalt and resins, but free from heavy oils, have many valuable applications in industry. They consist of a colloidal dispersion of asphalt materials in high-melting-point microcrystalline waxes, which latter act as the protective colloids and constitute the continuous phase of the dispersion.

A series of new products has been developed representing colloidal systems analogous to petroleum asphalts, but having the oily phase of the latter substituted by microcrystalline waxes of high melting points (175-205°F) and excellent oil-retention properties. They compare, therefore favorably with petroleum asphalts by their relatively sharp melting points, low viscosity in the liquid state immediately above their melting points and extremely low water-absorption properties due to their wax base. This group of new raw materials seems to be specially indicated for roof-metal coatings and requires less equipment and lower temperature for application than compounds with an asphalt base.

They behave differently from petroleum asphalt when "blown" by air. In ordinary petroleum asphalts the asphaltenes are dispersed in the oily constituents, and the dispersion is stabilized by resins which act as protective colloids. The degree of the dispersion has been proved to depend upon the resin concentration. Upon "blowing," this stabilization is mainly lost, as the formation of petroleum insoluble asphaltenes is increased out of proportion. "Blown" asphalts sometimes show a steep rise in penetration values as the temperature is raised and exude from joints in hot weather.

On the other hand, on "blowing" an asphalt-wax dispersion, the asphaltenes become more and more polymerized, and the viscosity value of the mixture increases. The recovered wax, however, showed no oxidation during blowing and the acid number was zero. The physical characteristics of the asphalt-wax dispersion can be modified without changing properties of the microcrystalline waxes.

U.S.P. 2,424,671 describes the first process used in the United States for industrial production of emulsifiable waxes from tank bottoms by oxidation. This industry, since it was first introduced by the writer about five years ago, has been continuously growing, and waxes resmbling beeswax, carnauba-wax, montan-wax, as well as new wax-esters of completely new properties are being produced in ever-increasing quantities by oxidation of de-oiled tank bottom waxes.

In a lecture given during the last yearly Asphalt Convention in Buenos Aires, the writer discussed the possibilities of the application of these waxes (especially their derivatives with polar groups,) in the asphalt industry and their influence upon certain characteristics of asphaltic bitumens. It seems that an entirely new field of application can be opened for these waxes and their polar derivatives, which behave like colloids in their mixtures with hydrocarbons and interact with suspensoidal sols or gels. It remains to make them available at a price which allows their use in the asphalt industry.

RECORD SALES AND INCOME REACHED IN 1947

By Henry E. Rose

THE American oil industry operated at record-breaking levels in all divisions in 1947. Supply and demand were in virtual balance and prices were higher. In reflection of these conditions sales and net earnings were at new peaks, substantially above those in the previous record year of 1946.

Peak operations are continuing in the current year both from the standpoint of supply and demand. Industry economists estimate that the available supply of petroleum, barring unforeseen contingencies, will be almost eight percent higher than in 1947. Demand, it is expected, will run nip and tuck with this supply. These factors, together with price improvement which materialized late in 1947 in crude oil and products, predicate a continuing high level of earning power throughout 1948.

For the first quarter of the current year the income accounts published by twenty-seven companies reflect this further improvement. The earnings of those companies aggregated $280,294,434 in the period and compared with $137,205,973 in the corresponding three months of 1947, an increase of 105 percent. This year's higher earnings reflect the recent price betterment and the further expansion in production and sales. The quarterly earnings of these companies are shown in the accompanying tabulation.

Giving consideration to the factors of increased production and sales and to the generally higher prices prevailing during 1947, the net earnings of 23 domestic companies used in WORLD PETROLEUM's annual financial survey aggregated the record total of $1,300,128,000 last year. This marked an increase of 60.5 percent compared with $810,631,000 earned in 1946, the previous peak, and with $554,044,000 earned by these same companies in 1941, the last prewar year. The record in the prewar period was scored in 1937 when earnings amounted to $607,404,000.

Every one of the twenty-three companies marked up a substantial gain in profits during 1947. In the case of one company, Skelly Oil Co., the improvement acounted to slightly more than 100 percent, while several had gains amounting to nearly 50 percent.

The 1947 earnings, applied to the 202,722,565 shares of common stock outstanding, after allowing for the payment of dividends on preferred shares of six companies, were equal to $6.37 a share. This compared with $4.05 a share netted in 1946 on 198,471,957 shares outstanding in that year, and with $3.45 a share in 1944, the peak of earnings during the war.

Coincident with the improvement in earnings last year, cash dividend payments to common stockholders were at record heights, although the disbursements were not as large in relation to total earnings as in previous years. During 1947 the twenty-three companies paid cash dividends aggregating $448,072,000, equal to 34.8 percent of earnings applicable to the common stock. Such total cash payments were 31 percent higher than in 1946 when $342,334,000 in dividends were paid out, or the equal of 42.2 percent of such earnings applicable to the common stock. In 1945 cash dividend payments were equal to 47 percent of earnings.

That a smaller proportion of earnings was paid out to equity stockholders in 1947 in spite of the establishment of new high records is due to the need for the reinvestment of a substantial part of such earnings—plus outside borrowings in some instances—to provide for expansion and modernization of facilities in order to meet constantly rising demands for products from the public, industry and the government. The oil industry, throughout its growth, has traditionally financed the major part of such expansion from reinvestment, or "plowing back," of its earnings. Since the war's end demand for oil products has skyrocketed, and the industry has been utilizing its facilities at maximum capacity to meet those demands. The industry was not able to proceed with normal expansion during the war, and since that time postwar shortages of essential materials, especially steel, have hampered construction programs with resultant delays ranging from several months to more than two years.

Because of these conditions—record demands for products and inability to provide normal expansion—the industry is engaged in record expansion and modernization requiring the investment of billions of dollars in all divisions during the next few years. In the two-year period of 1947-1948 such investment is estimated at $4,000,000,000. In the immediate prewar period capital expenditures approximated less than $700,000,000 annually, so today's requirements are more than double.

Some indication of the vast sums which the industry is investing in new and expanded facilities is had from the fact that twenty companies in 1947 made expenditures of more than $1,500,000,000 or about 60 percent more than were made in 1946. Moreover, such capital investments were about 70 percent greater than the earnings in 1947, indicating the need to dip into cash resources as well as to utilize ordinary depreciation reserves and to borrow from outside sources.

With particular reference to depreciation reserves, these have not been adequate under today's rising prices to provide adequately for replacement of worn out or obsolete facilities. One company reported that its depreciation reserves are about 30 percent short of those needed today on a replacement basis, and it has been necessary to dip into cash to make up this shortage.

A typical instance of how expansion is being provided under today's inflated price levels was cited by one of the industry's largest companies. The replacement and expansion of its facilities—in all divisions—entailed a cost 58 percent greater than its earnings in 1947. In allocating the capital expenditures in that year, 43 percent was

TABLE I

Income of 27 Oil Companies, First Quarter 1947-48

	1948 Net Income	1948 Per Common Share	1947 Net Income	1947 Per Common Share
Anderson Pritchard	$ 1,428,189	$2.17	$ 636,699	$ .95
Atlantic	8,179,680	2.89	2,764,730	.95
Barnsdall	3,385,780	1.52	1,664,542	.75
Continental	13,849,543	2.92	6,559,706	1.38
Deep Rock	846,409	2.11	497,936	1.24
Gulf	38,515,000	3.39	19,676,000	1.73
Houston	1,695,602	1.54	883,510	.80
Lion	2,988,848	2.55	1,391,216	1.19
Maracaibo Oil Expl.	60,219	.15	27,671	.07
Mid-Continent	7,007,163	3.77	3,869,130	2.08
Ohio	12,447,155	1.90	5,891,915	.90
Pacific Western	1,466,982	1.46	643,892	.64
Phillips	18,154,148	3.00	6,210,355	1.26
Plymouth	1,669,961	1.60	681,071	.65
Richfield	3,830,771	.96	2,531,410	.63
Seaboard	1,971,078	1.60	1,175,857	.95
Skelly	8,960,029	9.13	2,923,654	2.98
Shell Union	28,980,383	2.15	10,877,071	.81
Standard (California)	37,106,904	2.85	18,493,967	1.42
Socony-Vacuum	33,000,000	1.06	19,000,000	.61
Sunray	4,126,025	.78	2,066,464	.38
Texas Co.	27,974,839	2.08	18,582.445	1.65
Tide Water	11,163,000	1.71	5,180,274	.77
Texas Gulf	1,074,936	1.06	539,326	.52
Texas Pac. Coal & Oil	1,801,798	2.03	692,964	.78
Union Oil	7,795,006	1.62	3,550,631	.71
Univ. Consol.	814,986	4.38	193,537	1.04
TOTAL	$280,295,434		$137,205,973	

Increase compared with 1947—105.0%

financed from earnings; 33 percent from depreciation reserves; 12 percent from the sale of certain assets and 12 percent from working capital.

Today's earnings of the oil companies, and in fact of all companies, appear to be high in relation to those in earlier years. But the actual purchasing power of those earnings has been reduced sharply by rising prices and, consequently, they buy approximately 40 percent less than before the war. One large company pointed this out by stating that on the basis of average purchasing power for materials in the four-year period from 1937 to 1941 inclusive, its earnings in 1947 (which were 51 percent higher than in 1946) were up only 25 percent, while the quantity of products sold had gone up 79 percent.

A part reflection of the increased capital needed to expand and modernize facilities is shown in the funded, or long-term, debt of nineteen of the twenty-three companies. At the end of 1947 this debt totaled $1,434,732,000, the highest in history. It was $325,329,000 greater than that at the end of 1946, and $461,691,000 higher than at the end of 1941 when 20 companies reported such indebtedness.

Eight of the nineteen companies increased their debts last year, the largest increases being shown by Gulf Oil Corp. and Standard Oil Co. (Indiana). Standard Oil Co. (N. J.), Sinclair Oil Corp., Socony-Vacuum Oil Co. and Union Oil Co. of California accounted for most of the remainder.

Companies which showed reductions ranging from $2,000,000 to $5,700,000 included Atlantic Refining Co., Ohio Oil Co., Phillips Petroleum Co., Sun Oil Co. and Tide Water Associated Oil Co. The latter, incidentally, had reduced its debt to $4,500,000 at the end of 1947 and on April 15 of this year had paid off that remainder.

Other important changes have taken place since the turn of the year, some for the purpose of providing additional funds with which to undertake modernization and expansion.

Sinclair Oil Corp. sold an issue of $50,000,000 of 2⅞ percent, 25-year debentures to an insurance company to complete its expansion and moderization program, while Standard Oil Co. (Indiana) in March sold $50,000,000 of 2¾ percent debentures, maturing in 1963, to finance its major construction program in 1948 and 1949.

Gulf Oil Corp. recently borrowed $84,000,000 for 25 years at three percent from an insurance company to pay off bank loans in a similar amount. In February Gulf also sold 2,269,050 shares of capital stock for which it received approximately $113,000,000 which is to be used for moderization and expansion.

Moreover, Gulf stockholders were asked late in May to act on a proposal of directors to increase the company's authorized capital stock to 20,000,000 shares of $25 par from 12,000,000 shares. The stockholders were informed in March that the company had no plans to incur additional indebtedness or to issue additional shares of capital stock.

Early this year Standard Oil Co. (Ohio) sold $35,000,000 of 20-year, three percent debentures to a small group of institutional investors, using the proceeds to redeem an outstanding issue of $15,000,000 of three percent debentures due in 1962, and the remainder was added to general funds of the company. During 1947 the company offered 584,320 shares of capital stock to its holders on the basis of one share for each five shares held.

Phillips Petroleum Co., late in 1947, sold 1,007,517 shares of capital stock at $49 a share to its holders, the proceeds being used for prepayment of bang loans amounting to $46,375,000 and the remainder being added to corporate funds.

Texas Co. offered 2,248,932 shares of its capital stock to holders at $45 a share, adding the proceeds to general funds while Union Oil Co. sold $15,000,000 of 2.8 percent 25-year debentures adding the proceeds from this sale to its general funds.

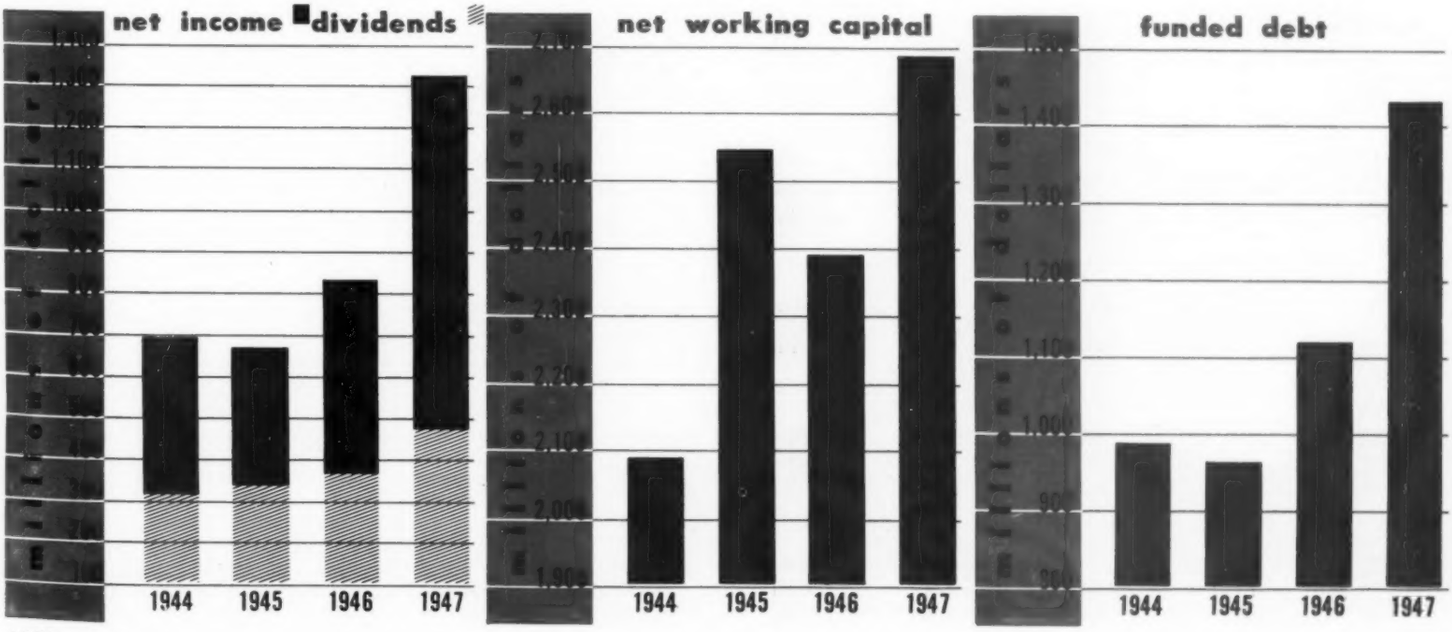
Eugene Holman, President, Standard Oil Co. (N. J.), right, being interviewed by Harold Stepler during a broadcast early in May of the Corporation's Annual Report.

Stockholders of Standard Oil Co. (N. J.) were asked at the annual meeting early in June to vote on a proposal of directors to increase the company's authorized capital stock to 35,000,000 shares of $25 par value, from 30,000,000 shares. The management, in making the proposal, declared that there is "no present plan" to market any additional stock but it wishes "to allow a sufficient number of shares in reserve to meet future requirements."

Reviewing dividend action of the twenty-three companies in 1947, it is significant that twenty-two increased payments to common stockholders in the form of extras, or in lifting the regular periodical payments. Atlantic Refining Co. was the single company which did not increase payments last year, its disbursement being $1.50 a share, unchanged from 1946.

The largest total cash outlay was made by Standard Oil Co. (N. J.) whose dividends on common stock aggregated $109,334,968, or the equal of $4 a share. In 1946 Standard paid its common stockholders the equivalent of $3 a share, and in 1945, $2.50 a share. Humble Oil

(Text continued on page 73)



FIVE YEARS FINANCIAL REVIEW OF

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Amerada Corp.								
1947	$14,919,626	$9.46	$19,050,060	$23,891,321	.....	.....	1,577,350	$31,646,731
1946	8,855,975	5.61	12,911,224	20,080,891	.....	..... (D)	1,577,350	21,459,154
1945	5,396,770	6.84	9,471,634	17,225,600	.....	.....	788,675	15,560,710
1944	5,285,988	6.70	8,566,051	15,927,801	.....	.....	788,675	13,585,670
1943	4,781,771	6.06	8,615,413	13,434,753	.....	.....	788,675	10,665,707
Atlantic Refining Co.								
1947	15,897,652	5.32	57,559,600	224,124,689	$34,210,000	500,000	2,660,867	131,137,496
1946	9,632,926	3.26	43,317,784	205,560,012	37,211,229	148,000	2,663,998	121,547,604
1945	1,509,107	.34	46,293,657	189,688,970	40,179,220	148,000	2,663,998	115,626,758
1944	14,710,913	5.30	45,675,417	192,279,722	31,009,123	148,000	2,663,998	118,061,797
1943	10,687,828	3.79	44,630,707	180,655,671	32,632,928	148,000	2,663,998	105,669,559
Barnsdall Oil Co.								
1947	9,119,030	4.10	11,848,245	23,417,011	.....	.....	2,223,307	24,453,607
1946	5,113,811	2.30	9,056,280	19,222,629	.....	.....	2,223,307	17,666,642
1945	4,389,779	1.97	6,533,192	17,798,321	.....	.....	2,223,307	13,717,216
1944	3,674,766	1.65	5,498,163	15,977,894	.....	.....	2,223,307	10,861,185
1943	3,602,764	1.62	5,546,689	14,233,620	.....	.....	2,223,225	9,024,509
Continental Oil Corp.								
1947	31,356,663	6.61	38,971,853	119,081,476	1,790,493	.....	4,747,155	144,615,436
1946	19,013,899	4.05	30,935,190	109,472,845	1,118,925	.....	4,694,251	123,359,887
1945	15,142,870	3.23	21,367,915	107,941,335	2,101,890	.....	4,682,557	111,885,294
1944	12,020,527	2.57	30,132,843	88,999,748	1,518,244	.....	4,916,987	103,234,221
1943	14,080,702	3.00	32,727,193	82,290,941	2,806,743	.....	4,682,561	100,004,761
Creole Petroleum Corp.								
1947	130,750,261	5.06	29,956,350	313,568,324	.....	.....	25,865,110	199,636,860
1946	83,305,686	3.13	55,563,445	233,193,158	.....	.....	26,606,610	142,329,526
1945	64,601,781	2.43	47,301,411	169,296,022	.....	.....	26,606,610	105,585,408
1944	62,020,396	2.33	37,850,361	166,578,162	.....	.....	26,606,610	74,241,889
1943 (B)	28,559,169	1.07	20,788,692	154,684,278	.....	.....	26,606,610	45,479,756
Gulf Oil Co.								
1947	95,540,059	10.53	129,541,065	577,520,002	184,601,035	.....	9,076,202	307,683,569
1946	58,284,830	6.42	83,221,420	485,799,531	59,672,985	.....	9,076,202	225,865,332
1945	45,213,640	4.98	91,459,870	446,736,575	49,360,719	.....	9,076,202	208,315,892
1944	42,075,513	4.64	101,635,902	409,833,584	48,443,118	.....	9,076,202	181,254,656
1943	29,301,053	3.29	101,190,142	382,301,066	52,992,991	.....	9,076,202	153,516,655
Humble Oil & Refining Co.								
1947	124,106,877	6.90	116,481,276	481,690,757	42,366,492	.....	17,975,680	259,654,556
1946	71,831,758	4.00	92,101,800	437,500,998	42,739,798	.....	17,975,680 (E)	189,474,719
1945	70,895,006	3.94	101,848,196	384,198,125	43,613,457	.....	17,975,680	269,853,441
1944	60,525,774	3.37	82,299,423	353,559,531	42,662,491	.....	17,915,680	221,796,955
1943	45,711,511	2.54	70,668,062	341,516,999	53,533,744	.....	17,975,680	188,234,701
Imperial Oil, Ltd.								
1947	20,464,381	.75	67,164,791	76,561,041	24,000,000	.....	27,090,590	72,161,435
1946	17,326,112	.64	61,532,933	54,862,144	.....	.....	26,965,078	65,549,119
1945	16,616,586	.61	74,521,062	38,333,859	.....	.....	26,965,078	59,286,892
1944	16,192,670	.60	74,702,544	38,879,829	.....	.....	26,965,078	59,441,568
1943	15,548,873	.57	69,604,722	40,455,813	.....	.....	26,965,078	56,345,318
Mid-Continent Petroleum Corp.								
1947	17,638,933	9.49	42,257,012	52,318,269	.....	.....	1,857,912	73,547,597
1946	10,084,581	5.43	36,546,658	44,163,951	.....	.....	1,857,912	61,578,530
1945	8,062,792	4.34	34,829,652	41,594,097	.....	.....	1,857,812	56,581,775
1944	6,942,038	3.74	35,820,077	37,201,893	.....	.....	1,857,912	54,341,053
1943	6,566,618	3.53	32,729,621	36,450,773	.....	.....	1,857,912	50,583,350
Ohio Oil Co.								
1947	29,161,496	4.44	40,339,466	95,033,850	3,000,000	.....	6,563,377	59,576,609
1946	18,253,236	2.78	42,575,885	81,024,999	8,000,000	.....	6,563,377	41,379,020
1945	13,949,822	2.13	37,001,770	79,673,840	9,500,000	.....	6,563,377	51,804,212
1944	15,082,127	2.30	30,683,091	80,316,287	11,000,000	.....	6,563,377	44,417,766
1943	14,146,802	2.14	26,347,464	76,236,983	12,500,000	.....	6,563,277	35,899,013
Phillips Petroleum Co.								
1947	40,893,647	8.11	66,276,074	291,393,262	41,884,723	.....	6,045,106	124,039,395
1946	22,625,151	4.60	44,550,509	236,560,987	43,833,211	.....	4,916,987	94,182,086
1945	22,571,509	4.50	42,310,294	222,698,646	45,989,518	.....	4,916,987	81,390,909
1944	20,952,088	4.26	30,752,672	235,972,999	48,812,688	.....	4,916,987	68,853,374
1943	14,168,422	3.04	24,494,808	205,917,876	28,707,826	.....	4,916,987	57,535,250
Pure Oil Co.								
1947	21,197,069	4.77	49,952,231	157,628,084	32,556,242	442,434	3,982,031	95,026,757
1946	17,107,961	3.74	52,038,916	136,931,651	31,064,611	442,434	3,982,033	82,013,518
1945	13,581,770	2.64	55,486,989	126,537,915	32,670,992	442,434	3,982,031	72,094,085
1944	16,392,178	3.11	40,060,767	(A) 133,029,554	2,415,806	725,431	3,982,431 (A)	67,813,020
1943	13,874,517	2.50	32,089,974	151,721,887	2,829,457	725,431	3,982,031	78,833,591
Seaboard Oil Co.								
1947	5,941,002	4.83	8,184,998	8,784,163	.....	.....	1,229,230	14,226,425
1946	3,000,586	2.43	4,769,046	8,557,413	.....	.....	1,234,232	10,133,008
1945	2,720,022	2.20	3,332,211	8,508,948	1,733,333	.....	1,234,233	6,663,989
1944	1,881,284	1.52	3,452,654	7,841,302	2,433,333	.....	1,234,235	5,178,190
1943	1,949,696	1.58	4,512,666	7,410,791	3,040,000	.....	1,234,237	4,097,062

UNITED STATES OIL COMPANIES

	Net Income	Per Share of Com.	Net Working Capital	Net Capital Assets	Funded and or Long Term Debt	No. of Pref. Shares	No. of Com. Shares	Surplus
Shell Union Oil Corp.								
1947	$59,874,698	$4.44	$114,673,825	$276,657,900	$122,995,000	.....	13,470,625	$104,719,558
1946	32,880,417	2.44	179,679,959	191,962,583	124,000,000	.....	13,470,625	83,253,766
1945	28,712,328	2.13	146,416,443	175,254,538	81,641,000	.....	13,470,625	60,579,277
1944	28,163,961	2.09	114,096,944	213,471,518	84,873,000	.....	13,470,625	60,404,897
1943	24,542,656	1.82	90,151,050	222,510,924	94,135,000	.....	13,470,625	42,446,874
Sinclair Oil Corp.								
1947	48,776,125	4.07	175,978,494	298,370,681	156,371,677	.....	11,974,021	279,630,632
1946	27,607,645	2.30	148,524,551	242,091,785	108,431,680	.....	11,924,041	245,819,783
1945	15,644,749	1.30	158,722,856	213,268,030	110,475,065	.....	11,974,058	230,182,487
1944	27,367,794	2.28	92,255,494	241,573,524	61,706,525	.....	11,974,094	226,508,979
1943	23,083,709	1.85	89,494,580	239,682,758	66,801,857	.....	12,928,205	209,148,169
Skelly Oil Co.								
1947	21,090,936	21.49	21,912,251	88,030,205	15,600,000	.....	981,342	77,887,985
1946	10,108,765	10.30	16,291,391	74,599,381	16,400,000	.....	981,348	59,250,404
1945	8,531,274	8.69	16,597,603	67,161,858	17,200,000	.....	981,349	51,104,336
1944	7,222,903	7.36	11,541,852	58,319,784	10,000,000	.....	981,349	44,535,759
1943	5,461,708	5.56	11,772,045	53,808,491	11,200,000	.....	981,349	39,154,199
Socony-Vacuum Oil Co., Inc.								
1947	97,708,927	3.13	265,646,171	637,748,563	140,000,000	.....	31,178,319	450,496,319
1946	58,310,569	1.87	266,082,299	577,619,321	125,000,000	.....	31,178,323	379,813,495
1945	42,301,983	1.36	274,222,734	509,955,895	100,315,279	.....	31,178,323	321,695,393
1944	62,349,556	2.00	280,510,156	511,462,505	118,077,823	.....	31,708,452	229,990,725
1943	35,944,983	1.15	271,335,854	499,503,866	126,716,312	.....	31,708,452	191,024,911
Standard Oil Co. of California								
1947	107,268,575	8.25	103,273,784	606,011,265	44,796,559	.....	13,003,953	384,447,313
1946	66,956,611	5.15	90,373,940	519,861,157	40,000,000	.....	13,003,953	320,734,788
1945	55,548,628	4.27	113,442,810	473,027,029	38,500,000	.....	13,003,953	284,503,528
1944	43,467,997	3.34	122,616,220	466,865,826	40,000,000	.....	13,003,953	260,871,654
1943	36,116,060	2.78	111,393,415	466,335,156	40,000,000	.....	13,003,953	245,657,323
Standard Oil Co. of Indiana								
1947	94,880,715	6.21	199,715,280	797,689,716	174,346,231	.....	15,284,806	542,749,899
1946	67,649,785	4.43	189,970,915	637,231,383	66,982,830	.....	15,284,830	478,439,433
1945	50,340,476	3.29	222,713,624	530,228,098	19,303,041	.....	15,284,860	437,538,439
1944	59,225,578	3.87	181,904,301	539,352,256	12,042,641	.....	15,284,864	409,881,287
1943	50,591,371	3.31	186,639,059	498,147,998	17,537,965	.....	15,284,876	377,731,563
Standard Oil Co. (N. J.)								
1947	268,626,589	9.83	690,068,515	1,524,122,335	218,503,349	.....	27,333,742	1,134,478,936
1946	177,609,931	6.50	739,031,209	1,274,429,578	198,206,986	.....	27,333,742	971,978,085
1945	154,156,196	5.64	779,818,746	1,137,441,311	203,129,907	.....	27,333,742	857,287,258
1944	155,396,460	5.69	697,078,842	1,103,125,811	214,855,260	.....	27,333,742	697,078,482
1943	121,327,773	4.45	585,859,209	1,092,251,188	232,157,560	.....	27,283,587	672,584,273
Standard Oil Co. of Ohio								
1947	16,390,585	4.41	36,823,998	101,377,991	16,257,965	253,035	3,504,835	72,863,521
1946	10,324,797	3.43	30,662,528	84,744,061	16,711,835	252,000	2,737,074	50,138,079
1945	3,713,161	1.10	39,045,305	76,463,002	16,566,863	238,665 (C)	2,676,383	43,686,806
1944	6,744,014	7.07	24,173,817	74,989,555	20,199,617	221,389	807,585	41,466,795
1943	4,905,634	5.68	20,098,777	67,853,801	22,179,387	221,389	758,519	37,729,768
Sun Oil Co.								
1947	24,339,913	5.28	47,718,318	136,500,595	1,005,648	93,197	4,528,532	42,155,774
1946	14,726,551	4.17	49,662,405	114,622,553	6,750,914	93,197	3,434,944	38,452,703
1945	15,666,543	4.44	47,936,056	102,480,572	4,588,218	93,197	3,434,944	25,798,504
1944	13,350,217	4.15	60,254,429	110,955,911	34,739,756	93,197	3,119,582	27,344,493
1943	13,353,524	4.56	59,380,803	104,366,531	35,894,794	93,197	2,833,929	27,062,509
The Texas Co.								
1947	106,312,617	7.90	363,780,648	487,204,696	146,846,291	.....	13,461,096	492,110,494
1946	71,089,267	6.32	131,027,329	413,883,965	147,093,063	.....	11,244,669	359,482,341
1945	51,856,928	4.61	186,332,038	398,787,324	114,498,906	.....	11,244,660	316,801,859
1944	54,516,819	4.85	176,565,106	431,780,673	124,600,469	.....	11,244,660	293,056,581
1943	42,889,797	3.83	176,654,842	415,353,085	123,998,331	.....	11,186,279	265,299,559
Tide Water Associated Oil Co.								
1947	30,175,955	4.57	55,535,548	153,000,270	4,500,000	225,373	6,396,809	125,748,023
1946	19,757,707	2.93	50,735,936	140,154,130	7,250,000	268,778	6,396,809	98,842,428
1945	18,107,712	2.57	48,056,917	140,459,899	14,250,000	287,887	6,396,809	84,937,733
1944	17,787,202	2.43	49,971,786	147,485,770	21,250,000	500,000	6,386,809	61,118,436
1943	14,902,640	1.98	58,391,066	133,722,641	30,436,400	500,000	6,389,394	50,267,921
Union Oil Co. of California								
1947	18,910,860	3.85	46,129,154	178,407,499	54,600,000	250,000	4,666,270	49,974,256
1946	9,804,523	1.90	45,265,932	166,822,441	40,000,000	250,000	4,666,270	37,570,420
1945	9,201,123	1.87	56,487,921	154,637,919	40,000,000	250,000	4,666,270	33,399,667
1944	8,932,994	1.91	34,357,126	168,599,514	53,700,000	.....	4,666,270	32,248,766
1943	7,269,199	1.56	41,071,274	144,962,486	42,544,000	.....	4,666,270	27,525,466

(A) Giving effect to writeoffs in November, 1944, of $19,523,031 of patents, rights, trademarks, etc.
(B) Adjusted to give effect to Lago Petroleum Corp. earnings for all of 1943.
(C) Common stock split two-for-one in 1945.
(D) Stock split two-for-one early in 1946.
(E) After transferring $124,445,088 of prior year's earnings to capital stock account which is now carried at $300,000,000 against $175,000,000 at December 31, 1945.

EVOLUTION OF THE OIL AND GAS LEASE

By Leslie Moses
Attorney, Midstates Oil Corporation

RAPID advancement of the petroleum industry to a position of world economic importance has been accompanied by the development of a new field of law commonly referred to as the Law of Oil and Gas. This is a misnomer, for it should be referred to as the Law of the Oil and Gas Lease, because the oil and gas lease characterizes and distinguishes the subject throughout. The oil and gas lease, for reasons which are inherent in the very nature of the business of searching for and producing oil and gas, creates the relationship between the landowner and the operator which is best adapted to the practical aspect of the enterprise. It is almost the universal custom to develop properties through the medium of leases, so it follows as a logical sequence that the subject matter of most of the cases involving oil and gas is the lease.

Development of the lease form was closely allied to the development of the industry, and equally to the development of the theory of oil and gas in place. All have entered into their present-day form through about 90 years of adolescent conflict.

It was early observed that oil and gas could not be treated in a manner similar to the mining industry. The fact that oil and gas were considered migratory, wandering about under the surface of the earth of their own volition, escaping from one man's land to another's like a fugitive, gave rise to some very fanciful ideas. It took many years of jurisprudence to bring to light the fact that while oil and gas are prisoners in nature, they are not vagrants.

These facts are important in considering the development of the lease. The practical aspects of the industry had to be taken into account. The progress of the petroleum industry may be divided, broadly speaking, into two distinct periods of development, each characterized by methods, customs and usages diametrically opposed to each other.

Ideas and conditions prevalent in the early days of the industry demanded the immediate development of a lease or its forfeiture. The disabusing of the theory of the peripatetic tendencies of oil and gas and the need for holding blocks of land for future reserves marked the later period of the industry. These two differences in underlying ideas and methods were clearly reflected in the leases used.

The first oil lease of record is very different from the long, highly technical forms now in everyday use. It was imperfect in style, short and to the point. It read as follows:

"Agreed this 4th day of July, A.D. 1853, with J. D. Angier of Cherrytree Township, in the county of Venango, Pennsylvania, that he shall repair and keep in order the old oil spring on land in said Cherrytree Township, or dig and make new springs, and the expense to be deducted out of the proceeds of the oil and the balance, if any, to be equally divided, the one-half to J. D. Angier and the other half to Brewer, Watson and Company for the full term of five years from this, if profitable."

The necessity for an instrument permitting someone other than the landowner to develop property for oil and gas arose from the fact that the landowner was usually without adequate funds or sufficient knowledge to undertake the drilling of a well. When the Drake well was brought in in 1859, operators saw the speculative qualities of the business and looked around for a method or form of procedure to follow whereby they could develop, or hold land at a minimum of expense and obligation. The Drake well was drilled under this lease:

"Pennsylvania Rock Oil Company to E. B. Bowditch and E. L. Drake — **Dated Dec. 30, 1857 Deed Book P, p357 $1 in hand.**

"Demise and let all the lands owned or held under lease by said Company in the County of Venango, State of Pennsylvania, 'To bore, dig, mine, search for and obtain' oil, salt water, coal and all materials existing in and upon lands, and take, remove and sell such, etc., for their own exclusive use and benefit, for the term of 15 years, with the privilege of renewal for same term. Rental, one-eighth of all oil as collected from the springs in barrels furnished or paid for by lessees. Lessees may elect to purchase said one-eighth at 45 cents per gallon, but such election, when made, shall remain fixed. On all other minerals, 10 percent of the net profits. Lessees agree to prosecute operations as early in the spring of 1858 as the season will permit, and if they fail to work the property for an unreasonable time, or fail to pay rent for more than 60 days, the lease to be null and void.

"By agreement dated February 12, 1858, and recorded in Deed Book P, 4. 441, the above lease is amended so that 12 cents for every gallon of oil shall be in full of all other rental; also giving lessees the privilege of renewal for 25 years."

Another industry was in existence in Pennsylvania at that time. The early settlers needed salt badly and found they could obtain it by evaporating water secured from brine found in sands underlying their lands at shallow depths. The salt industry grew and was carried on for the most part by men who did not own the land but who had been granted the right to bore holes to the brine, produce and evaporate it. Their grants were in written form, based generally on a solid mineral lease, granting the operator the right to enter the premises and conduct operations. The leases were for fixed terms, either for periods of years or for as long as salt was being produced; provided that the landowner received sufficient salt for his own use as "royalty," usually every twelfth barrel. They had provisions for commencement of operations, due diligence in continuance, with penalties for breach. Consider those clauses in connection with the underlying principles of a modern mineral lease. Are there are essential differences? There should not be, for this type of agreement was the basis for the present-day lease. Upon the discovery of oil in that same area, those early salt leases were adopted, almost word for word, by the oil operators.

The Drake lease, quoted before, was crude in form but illustrative of such leases. Incidentally, on the basis of standard measure of 42 gallons to the barrel, the royalty oil would have brought $18.90 a barrel at a price of 45 cents per gallon. Imperfect as the lease was, it did contain the essential features of the modern instrument. All the new provisions, refinements and verbiage have not altered its fundamental characteristics. Other factors were represented in the development of the first lease forms. Wildcat plays were virtually unknown, development being restricted to proven areas or lands in the vicinity of wells. Drilling costs were relatively small as the depths were shallow. Operators were disposed to drill without regard to geology. Leases covered small tracts, ten acres being considered large, and one lease was developed in its entirely before another lease was taken. Usually no bonus was paid and no delay rentals provided for, the landowner considered immediate development and the prospect of royalties as sufficient consideration. Most of the leases between 1858 and 1875 contained provisions for immediate development. The courts were inclined to overestimate the existence and extent of drainage, basing their decisions on the erroneous concept that oil and gas moved at will under the land. They further held that the controlling inducement for a lease was immediate drilling, and the sole desire of the landowner, prospective royalties. The leases were construed in the light of promoting development, preventing delay and unproductiveness.

When the second phase of the industry began is difficult to determine. It does appear that after 1875 new conditions arose which thereafter were to characterize the industry. Men with vision and foresight saw the possibilities of the industry and became identified with it. Its rapid growth in a short space of time produced a group of men of wide experience, who had amassed considerable capital and were anxious to continue operations on a larger scale. They did not view the business any more as highly speculative, but looked upon it as a respectable type of enterprise commercially sound. In order to make it more attractive, it had to be made more conservative. There already was a market demand for oil, constantly expanding, so some system had to be

evolved to maintain a supply equal to demand.

The first step was to take leases for future, not immediate development as a backlog against future demands. This necessitated a new type of lease with delay rental clauses, which was called the "drill or pay" lease. To this was added a forfeiture clause if lessee failed to do either. In addition there were changes in the term of the leases. Previously many were from twenty-five to ninety-nine years. Lest it be misunderstood, that was the complete term of the lease, notwithstanding that there still might be production at the end of the term. If the landowner did not extend it, the lessee lost his producing wells. As a consequence, the lessee was prone to stop new development near the end of the term. The new leases, however, were taken for five or ten year terms with the addition of what is known as the "thereafter" clause, which provided for the extension of the fixed term in case production was had. The clause was simply that well-known phraseology "and so long therefater as oil or gas is produced in paying quantities."

The resulting effect of such clauses was self-evident. The lease terminated at the end of the fixed term if no development was had. The landowner was protected because his land would not be held for an indefinite period; the lessee was protected because he could defer drilling operations by paying delay rentals, and, further, once he had production, his lease continued as long as such production was had. This seemed to satisfy everyone, and it was generally believed that upon failure of the lessee to pay his rentals, the lease ipso facto terminated. Unfortunately, the "drill or pay" clause came before the courts in the case of Gayley v. Kellerman, 123 Pa. 491, 16 Atl. 474, and it was held that if the lessee neither drilled nor paid delay rentals, the lessor had the option to sue either to collect delay rentals or cancel the lease, and only the drilling of a well would relieve the lessee of paying delay rentals. Imagine the consternation of the lessee. Something had to be done to afford him relief. Shortening the term of the lease helped a little, but if the land was condemned, the lessee did not want to continue to pay rentals. The result was the incorporation of the "surrender" clause in the lease, which gave the lessee the right at any time to surrender the lease and be discharged of his obligations thereunder. The first surrender clause required that the lessee actually surrender the lease by affirmative action. It was later changed by adding the "unless" clause, an early form of which read:

"Provided, however, that this lease shall become null and void, and all rights thereunder shall cease and determine unless a well shall be completed on the said premises within one year from the date hereof, or unless the lessee shall pays at the rate of $— per year in advance for each additional year until the well shall be completed."

Here no affirmative action was necessary, there was no promise to pay rentals, hence no enforceable obligation, and no alternative right either to a well or rentals.

It should be noted that in the clause just quoted it was provided that the lease would become null and void unless a well was "completed" within a year from its date. Most of the earlier forms used the word "completed," which placed an additional burden on the lessee in that if he, in good faith, commenced a well but, through circumstances not of his making, could not complete the same prior to the end of the year, he would lose the well or pay rentals. The word later was changed to "commence" and now reads that commencement of operations will suffice to keep the lease in force.

One final development of the later period brings the evolution to a close. This was the inception of the cash consideration, the bonus, for the signing of the lease. It has been seen that in the early days of the industry little or nothing was paid for the lease, the landowner's sole profit being the royalty he would receive if the venture was a success, and the moving consideration being the obligation of the lessee to develop immediately. When the inducement of immediate development was withdrawn by the insertion of the rental provisions, something else was needed. This took the form of a payment of cash sufficient to satisfy the lessor. The amount was commensurate with the value of the land, taking into consideration its size, its location and, necessarily, how many other people were trying to get it.

This has been a brief resume of the fundamental considerations which underlay the development of the oil business and which were incident to the acquisition and development of land for oil and gas through the medium of the oil lease. As in all businesses where there is an opportunity for quick enrichment, one will find hangers-on looking for a "quick killing." However, the permanency of the industry is entirely dependent upon those who make it their exclusive business, who are active in many areas and who maintain a trained staff adapted to the business. The uncertainty of any venture is fully understood by them, yet they continue to operate. They have learned through years of experience that the permanent success of their business is possible only when they can use a lease which has been tried and found workable. Such a lease must contain the following basic considerations:

(1) An adequate cash bonus to the landowner.
(2) The customary provisions as to royalty.
(3) A fixed term.
(4) Supplementing the fixed term, a clause giving the lessee the option either to drill or pay rentals or surrender.

The inclusion of such provisions directly adapts the rights and obligations of lessor and lessee to the peculiar conditions under which the petroleum industry operates and affords both all the protection necessary.

Thus we have seen the evolution of the oil and gas lease. It is a far cry from the short lease of 1853 to the documents now in everydays use. However, even with the frills added, the modern lease still contains the four basic provisions that were incorporated in leases evolved before the turn of the century. The skeleton is the same, but like a lot of people after a certain length of time, it has certainly put on a lot of flesh.

The foregoing represents a condensation of an article appearing in Vol. XXII Tulane Law Review, 471, March 1948.

Oil leases in the days of the Pithole boom in western Pennsylvania were in essentially the same basic form used today.

New Socony Research Laboratories Place Emphasis On Physics

General view of chemistry and physics research building at Paulsboro.

SOCONY-VACUUM OIL CO., INC., recently invited neighbors at Paulsboro, N. J., in to visit its new chemistry and physics building at the research center. Not many were expected until late afternoon. But to everybody's surprise the new building was packed with visitors by noon, and before the day was over nearly 10,000 persons had peered at the electron microscope, Geiger counter, mass spectrometer and other modern research tools.

Paulsboro has been a research center for Socony-Vacuum since 1922, when several rooms in the refinery inspection laboratory were set aside for this purpose. Within 10 years the research staff had been increased to 150, and at the beginning of the war was up to 300. Wartime research activity expanded the staff to 500, and now, with the new buildings and equipment, a staff of 900 will be required.

Research activity in the refining branch of the oil industry has centered traditionally in the field of chemistry. Before the war physicists in the laboratories were few and far between. Inspection of the Paulsboro center reveals that they have a strong foothold in research today. Most of the physics researchers are young in years and young in service with Socony. Dr. J. H. Buck, supervisor of the physics division, for example, has been with the company only since 1946. In the new chemistry and physics building the present division is 45 physicists to 120 chemists. Most of the young physicists know little about the oil industry when they enter, so they are undertaking their investigations with eagerly inquiring minds.

In the physics division research is being centered currently on lubrication and on cracking. In the field of lubricants the researchers are trying to determine whether the generally accepted theories are correct or whether new concepts must be adopted in the light of physical inspection of oils and metals. The physicists aren't too sure why a lubricating oil prevents welding of metal parts or why one oil does a better job than another. For their studies they have the electron microscope capable of magnifications up to 100,000 diameters and other new tools such as the emission spectograph capable of revealing metals in minute particles of matter.

In the field of cracking the physicists have set out to determine the mechanism of catalytic cracking. In these studies they have such modern tools as an infra-red ray laboratory where room temperatures can be maintained within one degree of the level desired and relative humidity can be controlled and reduced to 25 percent. They have also the mass spectrograph for analysis backed up by an electronic computer capable of solving 12 intricate mathematical problems simultaneously.

Radioactivity studies are being undertaken in connection with both the lubrication and cracking studies. At Paulsboro radioactivity is not a project in itself as it is in the government laboratories. Here it is used as a tool.

In the study of various catalysts radioactivity is useful in determining just where a molecule is split by the various catalysts. This is done by synthesizing various hydrocarbon molecules using atoms of radioactive carbon 13 as tracers. By placing a tracer atom on one end of a straight chain molecule, for example, and then cracking the molecule, it will be possible to determine whether the molecular fission was at the end of the chain or elsewhere. By putting the tracer atom at various points in the chain, it will be possible to track down the cleavage exactly. The laboratories now are engaged in studying various types of catalysts, and from these investigations should come a great deal of information about a process concerning which too little is known today.

Individual laboratories in the new building are standardized in two sizes, 19 by 20 feet and 10 by 20 feet. Suites are built for the use of two or more men with an office and storage space between the laboratories themselves. The plan is that developed in certain government research activities. Each laboratory has an emergency escape hatch leading to adjoining rooms.

For added safety laboratories are equipped with individual fume hoods and independent transite ducts leading to the penthouse where motor-driven fans exhaust the fumes to the atmosphere. The building is air-conditioned. In the office section washed and filtered air is recirculated, but all laboratory air is exhausted through the fume hoods, none being returned to the air-conditioning equipment. Rooms have separate thermostats and humidistats.

Electron microscope in Socony laboratories.

Utilities for all laboratory suites are carried through shafts which permit easy access anywhere in the building and allow repairs and changes without affecting more than a single suite. Water distillation system in the building provides up to 50 gallons of distilled water per hour distributed through aluminum piping.

The library is stocked with 7,000 technical volumes and receives 200 periodicals monthly. Study facilities are available for as many as 50 persons at one time.

T. P. Simpson is director of the Paulsboro laboratories. Associate director and supervisor of the chemical section is A. A. O'Kelly. Supervisor of the physics section is J. H. Buck. Assistant directors of the laboratories include E. S. Nicholls, administrative assistant; G. H. Snyder, supervisor of the lubricating oil division; T. L. Apjohn, supervisor of the light products division, L. P. Evans, process development division, E. A. Martin, automotive division, and E. T. Scafe, inspection division.

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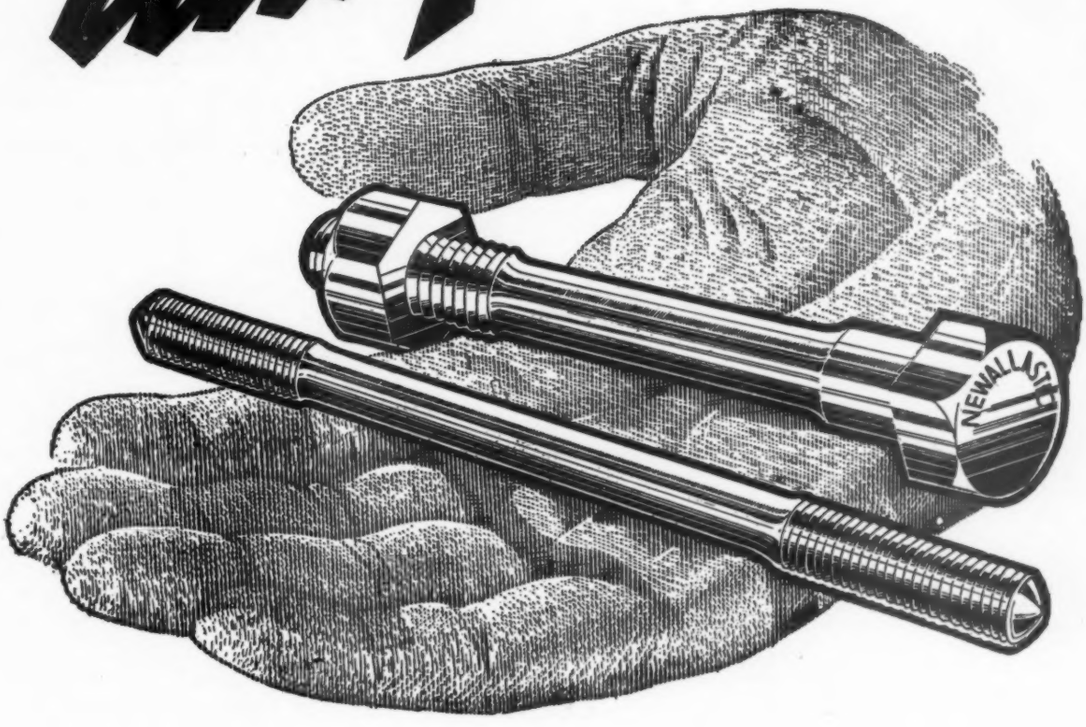

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International News and Notes

Dr. Hans E. Thalmann

Joins Venezuelan-Atlantic

Dr. Hans E. Thalmann, native of Berne, Switzerland, and graduate of the University of Berne, has been appointed chief paleontologist for Venezuelan Atlantic Refining Company. Before leaving Berne in 1925, he had served as assistant in the geological department of the Museum of Natural History and as secretary of the Society of Natural History.

From Switzerland he went to Mexico where for six years he was micropaleontologist for the Shell Company. In 1931 he began a year at The Hague as Shell's chief paleonthologist, and then acted in the same capacity for Shell in Sumatra and Java until 1934 when he went back to Switzerland. Here he returned to the University of Berne, this time as research associate. In 1935 he became chief paleontologist in Sumatra for Standard Vacuum, a position he held until May, 1941.

While Dr. Thalmann was on vacation in the United States, war began in the Pacific, and he was unable to return to Sumatra. During this interlude he held an honorary position at Leland Stanford University. In July, 1942, in behalf of Standard Oil Co. (N. J.) and International Petroleum Co., Ltd., he went to Ecuador and remained there until September, 1945. This period was followed by two years in New York for Standard Vacuum, a return trip to Switzerland and acceptance of his present position with Venezuelan Atlantic Refining Company.

Dr. Thalmann has written many articles on paleontological subjects, and since 1933 has published the "Bibliographic Index to Literature on Foraminfera," beginning with the year 1931.

J. A. RUTHVEN-MURRAY has been elected assistant managing director of Trinidad Leaseholds, Ltd., London, and made a member of the board. Mr. Ruthven-Murray was manager of Kern Oilfields operations in Trinidad for many years before joining Trinidad Leaseholds about 1941. He was called to the home office in London in April, 1947.

F. M. SMITH, whose service in the foreign field began in 1919 when he was assigned to the accounting staff in Istanbul, Turkey, has been appointed to membership on the foreign trade committee of Socony-Vacuum Oil Co. Mr. Smith's most recent assignment overseas has been as manager of the branch in Greece. In the early 1920's Mr. Smith was transferred from Istanbul to Jugoslavia as assistant general manager of the Standard-Vacuum Oil Company of Jugoslavia. He became general manager of that company in 1935 and served in that capacity until the Germans entered the country in the spring of 1941. He returned to the United States, and immediately after the close of the war he made several trips to Jugoslavia and in September, 1946, he became manager in Greece.

A. V. WALKER, general manager of Socony-Vacuum Oil Company's Levant division, with headquarters at Istanbul, Turkey, has retired after 39 years' service. He is succeeded by H. R. Arnold, assistant division manager. Mr. Walker's first assignment was in China in 1909. He went to Sofia, Bulgaria, just before World War I, and after the war he became general manager of the Socony-Vacuum Oil Co. of Jugoslavia.

Mr. Arnold, the new Levant division manager, joined Socony in 1919 and was assigned to Salonica, Greece. Early in the 1920's he was made manager at Sofia where he continued until his transfer to Turkey as manager in 1930. He was back in Sofia as manager of the Petrole Co. for some years and has been assistant general manager of the Levant division since 1937.

P. E. Nolan

Retires from Mene Grande

On April 29 the Mene Grande Oil Company, C.A., gave its annual presentation dinner at the Hotel Avila in Caracas, Venezuela. Most honored employee was P. E. Nolan, recipient of the 25-year award. Mr. Nolan, chief geologist for Mene Grande until last December, when he was succeeded by George L. Lockett, was honored in absentia, having retired at year's end to Sarasota, Florida. All of Mr. Nolan's 25 years of service were spent in Venezuela.

Recipients of the 20-year award were Hoyt Sherman, David B. Kowalski, Alberto E. Flores, Henrique Hopkins Acosta and Frederick Hulsmeier. Seven employees received the 10-year button: Joseph A. Rincones, Luis Alcala Sucre, Regulo Hurtado, Jose T. Machado, Arthur M. Kannee, Jose R. Puy Arena and Prudencio Eugui. All awards were presented by C. M. Crebbs, president of the company.

Production in Iran

Production of crude oil in Iran for the months of January and February is reported as 3,349,000 tons, an average of 429,780 barrels daily.

Evans Heads Institute of Petroleum

E. A. Evans of C. C. Wakefield & Co., Ltd., has been elected president of the Institute of Petroleum for the year 1948-49. Vice presidents for the new year are: E. B. Evans, Esso Development Co., Ltd.; H. Hyams, Shell Petroleum Co., Ltd.; V. C. Illing, Imperial College of Science; J. A. Oriel, "Shell" Refining & Marketing Co., Ltd.; C. A. P. Southwell, Kuwait Oil Co., Ltd., and H. C. Tett, Esso Development Co., Ltd. Honorary treasurer is G. H. Coxon, and honorary secretary is C. Chilvers, both of Anglo-Iranian Oil Co., Ltd.

Members of the council for the new year include: W. S. Ault and C. T. Brunner, Shell-Mex & B. P. Ltd.; A. T. Beazley and J. S. Parker, Lobitos Oilfields, Ltd.; M. A. L. Banks and E. Thornton, Anglo-Iranian Oil Co., Ltd.; E. J. Dunstan, Manchester Oil Refinery Ltd.; F. L. Garton, D. L. Samuel, E. J. Sturgess and H. de Wilde, all of Shell Petroleum Co., Ltd.; T. F. Laurie, Anglo-American Oil Co., Ltd.; F. Morton, Trinidad Leaseholds, Ltd.; H. E. F. Pracy, "Shell" Refining & Marketing Co., Ltd.; G. H. Smith, Scottish Oils Ltd.; E. Stokoe; A. Beeby Thompson, A. Beeby Thompson & Partners; G. H. Thornley, C. C. Wakefield & Co., Ltd.; R. R. Tweed, British Controlled Oilfields. Ltd.; A. T. Wilford, London Transport Executive; and W. J. Wilson, Burmah Oil Co., Ltd.

Argentinian Visitors

Capt. Eliseo Varela and Sr. Homero Lorusso of the Direccion General de Fabricaciones Militares, Argentina, are making a six-month tour of the United States and Canada to study the application of geophysical methods. Recently they received delivery of a shothole drilling unit from Engineering Laboratories, Inc., at Garland, Texas, and a recording truck and equipment at Tulsa.

Reviews British War Record

In his annual address as president of the Institute of Petroleum on April 30, Sir Andrew Agnew reviewed the history of the Petroleum Board from its conception in 1938 until the close of the war. The Board embraced 36 importing companies and 57 non-importing distributors with 20,000 employees and 1,000 installations. An offshoot was the Lubricating Pool with 21 importing members. Plans for the organization were completed before the declaration of war, and the board went into action at midnight on Sept. 3, 1939. Sir Andrew told of the vast problems encountered by the industry and how they were solved, including special problems of the invasion such as the rapid advance of Patton which outran fuel supplies and the cooperative work with the Petroleum Warfare Department in developing Pluto and Fido.

Some of the foreign guests at a recent meeting of the Los Angeles chapter of Nomads. Seated, left to right: Jean P. Lacroix, Regie Autonome de Petroles; S. L. Slaughter, Tropical Oil Co.; and A. F. Driskill, Iraq Petroleum Corp. Standing, left to right: A. C. Bush and H. E. Johnson, both of Drilling and Exploration Co.; and F. R. Wilmer of C.P.C., Maracaibo.

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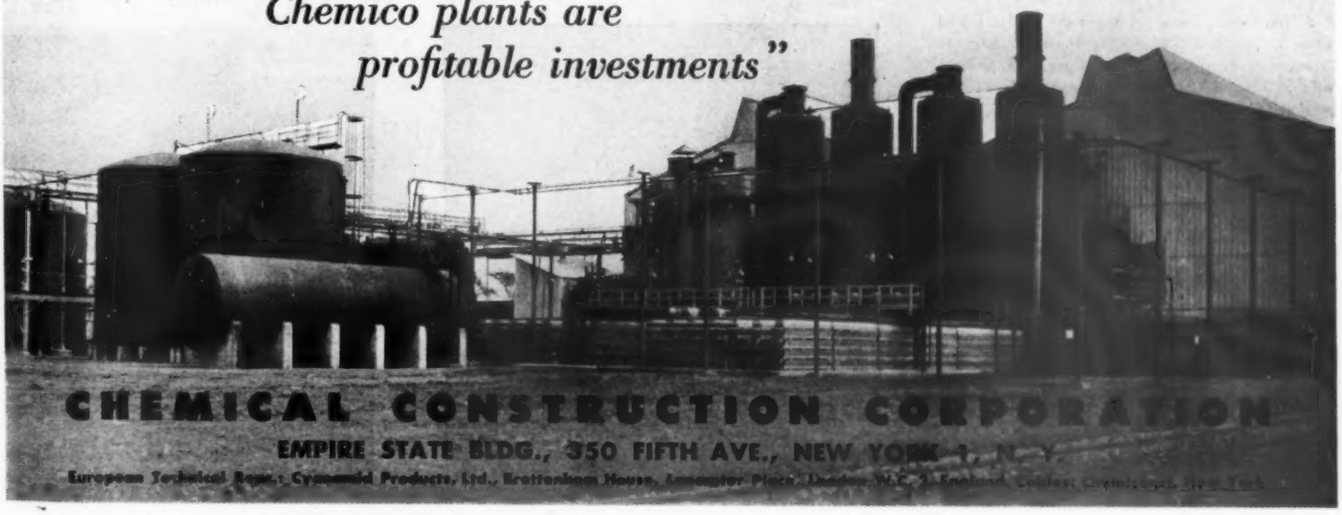

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OIL COMPANY STAFF CHANGES

Clyde T. Foster

CLYDE T. FOSTER, vice president of The Standard Oil Company (Ohio), has been elected executive vice president. Mr. Foster joined Sohio in 1929 as assistant manager of service stations. In 1931 he was made manager, and in 1935 head of the operating department of the sales department. In 1942 he became assistant to the president and in 1946 was elected vice president and a director.

C. H. MARSHALL, vice president of the Allied Oil Co., Inc., and its subsidiary Central Pipe Line Co., has taken charge also of the production department. His offices will remain at Salem, Illinois, for the present but will be moved to Oklahoma City later. G. F. NcNair has been made manager and Leslie Paris general superintendent of the southwestern division of the pipeline company. Mr. McNair formerly was with Pan American Production Co. at Houston. His new offices will be at Dallas.

R. W. FRENCH has been elected vice president of Sohio Petroleum Co., subsidiary of Standard Oil Co. of Ohio. He will move his headquarters from Oklahoma City to Cleveland, Ohio. Frank H. Willibrand will succeed him as manager of production operations and assistant vice president at Oklahoma City. He has been manager of the Mid-Continent division.

George S. Buchanan, assistant manager of land and exploration at Houston, Texas, offices, has been made as assistant vice president and manager of land and exploration. He will report to Vice President John P. Smoots at Cleveland.

EDWARD L. GHORMLEY, formerly of California Research Corporation, has joined the staff of George Armistead, Jr., consulting chemical engineer of Washington, D. C. Mr. Ghormley, who has recently completed graduate work at Massachusetts Institute of Technology, will be engaged in process and design engineering.

JOHN M. McILVAIN, administrative director for the research and development department of Atlantic Refining Company, was appointed chief of the industrial engineering division on May 24. Mr. McIlvain joined Atlantic in 1924 as a junior chemist immediately after obtaining his Bachelor of Science degree at the University of Pennsylvania.

J. B. Rogerson

J. B. ROGERSON, general superintendent for Lion Oil Refining Co., El Dorado, Ark., has been appointed manager of manufacturing and will direct both refinery and chemical plant operations of Lion. Mr. Rogerson joined the company in 1926 and served as plant engineer, chief engineer and process superintendent before his promotion. W. M. Carney, assistant general superintendent, has been promoted to general superintendent. Mr. Carney has been with Lion for 22 years.

OWEN D. FENDER, who was manager of the industrial relations department of the Lubrite division of Socony-Vacuum Oil Co., at St. Louis, has been transferred to the foreign trade department and assigned to the Near East division. He will be industrial relations manager of that division with headquarters in Cairo. Mr. Fender joined Socony-Vacuum as manager of Lubrite's safety and claims department in 1936. Since 1939 he has been manager of the industrial relations department.

JOHN P. DENNIS, assistant traffic manager for The Texas Company for the past six years, has been appointed traffic manager. He succeeds W. L. Macatee who is retiring after 36 years of service with Texaco. Mr. Dennis came to The Texas Company in 1942 as assistant traffic manager after many years of railroad experience.

John P. Dennis

DON R. KNOWLTON, president of Knowlton Engineering Co., Oklahoma City, has been elected president of Old Ocean Oil Co. and J. S. Abercrombie Co., Houston, to succeed Lloyd Noble who was elected chairman. Max R. Lents was elected vice president and general manager to succeed J. R. Butler.

Mr. Butler and Martin Miller have organized a consulting company which has been retailed by the two companies. Mr. Knowlton will continue to live in Oklahoma City and carry on his present activities.

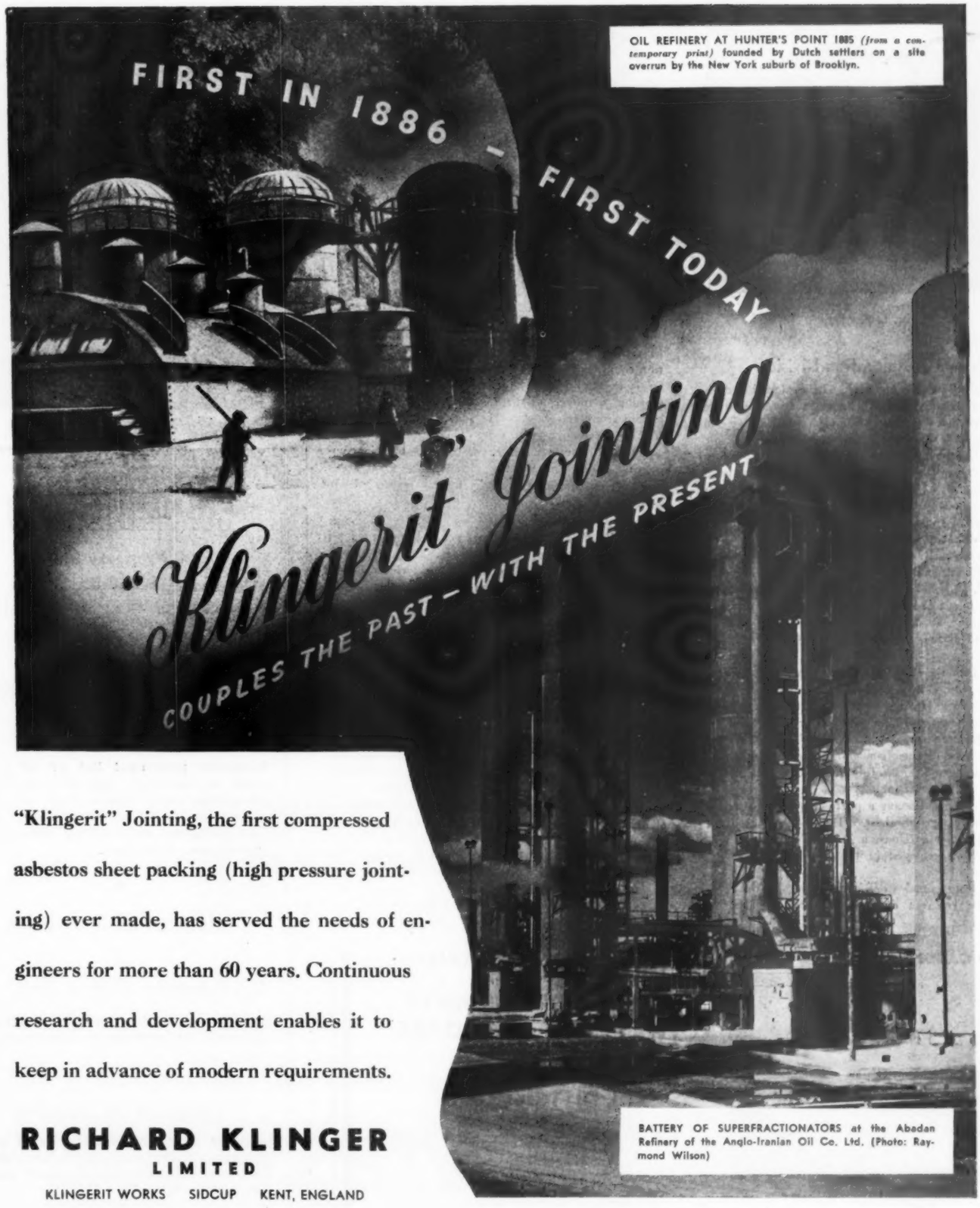
FRANK T. CLARK, division geologist for Cities Service Oil Co. at Houston, has been transferred to Fort Worth, Texas, where he will be in charge of a new district office to handle expanded exploration activities in New Mexico and north and west Texas. Frank Cooter, of Wichita Falls, is landman, and E. J. Gemmill, of Houston, geophysicist.

W. G. SEXTON, formerly chief engineer at Transit and Storage Co. has been elected president and general manager of Imperial Pipe Line Co., Ltd, with headquarters in Edmonton. Mr. Sexton joined Imperial in 1921 at Sarna, serving in various capacities in the refinery, engineering and accounting departments. In 1936 he was transferred to the United States with Transit and Storage Co., which operates pipelines from Ohio and Michigan, supplying crude to the Sarnia refinery. During World War II he served three years in the U. S. Navy, returning to Transit and Storage in 1945.

DR. ROBERT CLINTON PAGE of White Plains, N. Y., has been appointed medical director of the Arabian American Oil Company. He will assume his new duties on May 15. Dr. Page will make his headquarters in Dhahran, Saudia Arabia, where he will supervise the company's six hospitals and numerous clinics for Americans and Arabs. He will also direct the over-all medical and sanitary programs of the company in Saudi Arabia. Dr. Page joined the United States Army Medical Corps in 1942 and after service in the South Pacific area became assistant medical director of The Texas Company in May, 1946.

REX V. PHELPS has been appointed to the newly-created position of manager of the Warren Maritime Corp., according to G. L. Brennan, vice president. Mr. Phelps will continue as chief sales engineer for the liquefied petroleum gas division of Warren Petroleum Corp., of which the maritime corporation is a wholly-owned subsidiary. Mr. Phelps headed the corporation's engineering staff which supervised the construction of the SS "Natalie O. Warren," first tankship ever designed for the sole purpose of transporting propane and other liquefied petroleum gases.

Rex V. Phelps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BATTERY OF SUPERFRACTIONATORS at the Abadan Refinery of the Anglo-Iranian Oil Co. Ltd. (Photo: Raymond Wilson)

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Dr. L. F. Athy

Expands Exploration Division

Continental Oil Co. is expanding its exploration division, in preparation for which seven key men have been promoted to handle a wider sphere of activity in the geophysical and geological departments of the company. Those promoted are: Dr. L. F. Athy, chief geophysicist, to manager, geophysical department, Ponca City; Dr. J. A. Culbertson, division geologist at Houston, to assistant manager, geophysical department, Ponca City; D. D. Christner, division geologist at Fort Worth, to assistant chief geologist, Ponca City; W. Baxter Boyd, district geologist, Ponca City, to succeed Mr. Christner as division geologist, Forth Worth; Edgar W. Kimball, district geologist, Shreveport, Louisiana, to succeed Dr. Culbertson as division geologist, Houston; C. L. (Bill) Arnett, Kansas district geologist, to division geologist, Ponca City.

All seven men receiving promotion have long records of service with Continental. Dr. Athy joined Continental in 1925 as assistant geologist, research department, Ponca City, and four years later was made assistant superintendent, geophysical division. On May 1, 1932 he was named superintendent and was appointed chief geophysicist July 1, 1936. Dr. Culbertson joined Continental in 1933 as a member of a seismograph crew; he became a party chief and was then named control geophysicist. He became assistant division geologist at Houston in June, 1937, and was named division geologist in 1943.

H. R. Prescott joined Continental as a junior engineer in the research department at Ponca City in 1928. Through successive promotions he served in the gravity and seismograph sections, became chief of development in the geophysical department and was named assistant chief geophysicist in August, 1939. D. D. Christner started work as a geologist for Continental in 1924 and was named division geologist at Fort Worth in 1932. W. Baxter Boyd, who succeeds Mr. Christner as division geologist at Fort Worth, is a native Oklahoman and has been with Continental for 15 years.

Edgar W. Kimball, who moves from Shreveport to Houston as division geologist, has been associated with Continental since January, 1935. Prior to his promotion he had served in geological assignments at Hobbs, N. M., Wichita Falls, Texas and Shreveport. C. L. Arnett's association with Continental began in 1923 when he was employed as an instrument man in the geological department, Ponca City. He transferred to geophysical work in 1932 and was advanced to party chief in 1934. He was appointed Kansas district geologist in June, 1936.

Heads National Equipment Sales

Marion E. Swaim was appointed manager of production equipment sales of The National Supply Company on June 1, according to an announcement by R. W. Gordon, manager, oil field sales. He will make his headquarters in Toledo. He will have responsibility for the promotion and sale of oil field production equipment manufactured or distributed by the company and will continue supervision of the plant products division which he formerly headed from Houston, Texas, headquarters.

PATRICK C. HILL, assistant general manager of the Caribbean Petroleum Company, Caracas, Venezuela, has had a quarter century of experience in the oil industry and as petroleum advisor to the British government.

Born in London and educated at the Royal Naval Colleges of Osborn and Dartmouth, England, Mr. Hill's first business connection was a three-year period with the Anglo-Saxon Petroleum Corporation (Shell Group) at St. Helen's Court, London, beginning in 1921. From 1925 to 1938 he was an independent oil operator in Texas, New Mexico and Oklahoma, and he was made vice president and general manager of the Rector Oil Company, Inc., Fort Worth, Texas. There followed a period in government service from September 1939 to July 1945. Mr. Hill was oil advisor at the British Embassy in Washington until April 1941, and later became a member of the British Merchant Shipping Mission. He was also one of the British members of the Combined Shipping and Employment Committee and advisor to the Combined Shipping Adjustment Board. From July 1945 to September 1947, before going to Venezuela, he worked for the Asiatic Petroleum Corporation (Shell Group) in New York.

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This illustration from the W. P. Butterfield series of Yorkshire Dales Scenes shows the ancient Cave Chapel of St. Robert at Knaresborough in Nidderdale

Time has eroded the rock-hewn figure by the door into a curiously modern symbolism, the hand which mayhap once reached for the sword hilt now appears to be feeling for loose coins

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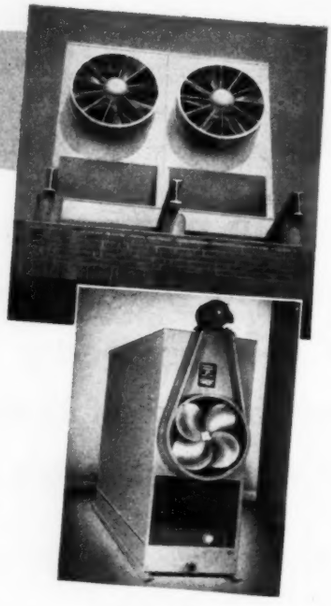

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JOHN DODGE of Pantepec Oil Co., who recently returned from a tour of duty in Venezuela, was principal speaker at the April meeting of the Los Angeles Nomads chapter. He told of the current royalty situation in Venezuela and the financial and labor problems of foreign oil companies. Shown above are Mr. Dodge, left, and Fred Ripley, president of the Los Angeles Nomads.

Oilwell Contractors Meeting

At their April meeting in New Orleans, director of the American Association of Oilwell Drilling Contractors registered their protest against the practice alleged to be followed by some manufacturers of drilling machinery of offering oil country tubular goods as an incentive to the purchase of rigs. By resolution the Association declared that the use of such tactics is detrimental to the best interests of the oil industry, inasmuch as tubular goods are in short supply while 25 percent of the drilling rigs in the country are stacked and idle because of the scarcity of casing and drill pipe.

British Industries Fair

Yorkshire Copper Works Ltd., Leeds, built an elaborate exhibit for the British Industries Fair at Birmingham, which was located at one of the main entrances. The exhibit was built about an efficient working office and a visitors lounge. On the exterior was a main feature into which seven display windows were built to show various Yorkshire products. On either side of the main feature were 24-inch seamless copper tubes to illustrate the wide variety of the company's products which run from this size down to .005 inch. One feature of the exhibit embraced a working model and large sectional model of Yorkshire fittings, showing the capillary action of solder which, when heated with a torch, makes a quick, permanent joint.

Venezuelan Production

Production of crude oil in Venezuela during the month of March amounted to 40,736,160 barrels, an average of 1,314,070 barrels daily. As compared with February, this daily average is higher by 16,356 barrels. It is interesting to note that on March 8 Venezuelan production reached an all-time high of 1,318,030 barrels per day. Exports for the month were 38,802,394 barrels. Production by companies is shown in the following table:

Company	West	East	Total
Creole	14,841,285	4,876,646	19,717,931
Mene Grande	1,867,165	4,830,970	6,698,135
Shell	12,429,345	—	12,429,345
Texas	—	195,056	195,056
Consolidada	—	604,380	604,380
Socony	—	951,619	951,619
S.A.P. Las Mercedes	—	29,021	29,021
B.C.O.	36,030	—	36,030
Orinoco	9,934	—	9,934
Phillips	—	63,565	63,565
Atlantic	—	1,144	1,144
Total barrels	29,183,759	11,522,401	40,736,160

Painting by Anna Zinkeisen

This Present Age . . . 3

That unity of purpose can be achieved once the nation is inspired by a sufficiently powerful incentive is one outstanding lesson of the war. We have re-awakened to the fact that we are, first and foremost, citizens of a great nation. Our national ways, whatever their faults and shortcomings, are yet so potent as to demand in their defence all that is best of our faith, courage and even our lives. This spirit must be our urge in the difficult years of reconstruction; it will be the motive and inspiration of all our endeavours. Granted the desire, goodwill and above all, unity of purpose, the many great and complicated problems can be satisfactorily resolved. No obstacles must be allowed to stand in the way of ensuring such a future and of deserving the just rewards of all our sacrifices. Unity of purpose in peace is the prerequisite of a swift accomplishment of these desirable objects, which of themselves, constitute a dynamic incentive. To keep faith with our comrades who have given their lives for democratic ideas of liberty, all our forces are being mobilised in administration, technology and production, so that by our united efforts we may contribute towards building a better world.

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Oxley Board Changes

H. H. Hollis has resigned as chairman and joint managing director of Oxley Engineering Co., Ltd., Hunslet, Leeds, England, because of ill health. He will retain his seat on the board. S. Stanfield succeeds him as joint managing director and general manager. H. Saville has been elected chairman. N. Dryden has been elected a director to succeed A. H. Johnson, resigned.

Dubbs Unit Sets New Record

The three-furnace Dubbs thermal cracking unit at Sunday Oil Corporation's refinery at Allen, Okla., recently was shut down for inspection and clean out after setting a new record run of 170 days and 22 hours. The unit processed 1,373,675 barrels of charging stock, an average of 8,037 barrels daily. The previous record run by a Dubbs thermal cracking unit was 168 days. The Allen unit, which is the only three-furnace thermal cracking plant built in the United States, was erected in 1945 and has a rated daily cracking capacity of 7,000 barrels.

Heads Ontario Engineers

George L. Macpherson, manager of the engineering and development division of the manufacturing department of Imperial Oil, Ltd., has been elected president of the Association of Professional Engineers of the Province of Ontario. Mr. Macpherson has been a member of the association for 10 years and a member of the council since 1944. He was elected vice president last year. George Macpherson joined Imperial in 1922. In 1935 he became assistant chief engineer and chief engineer in 1943. Mr. Macpherson's title was changed last May when the engineering and development division was formed.

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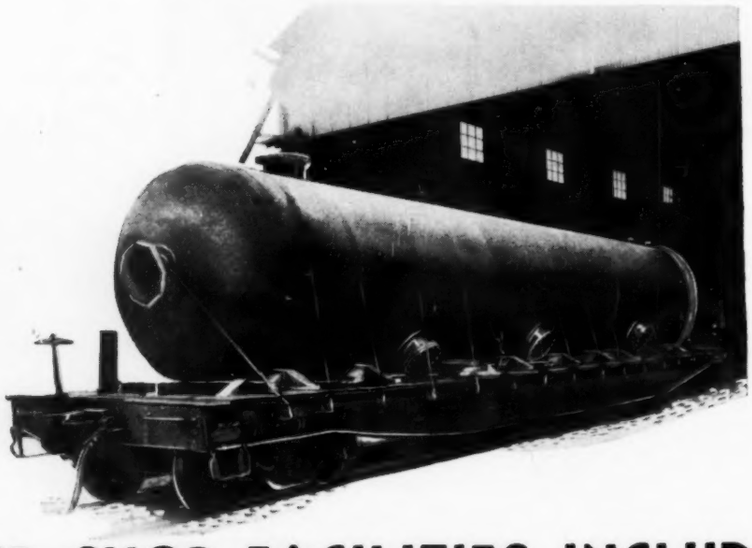

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Sun Opens Gulf Coast Terminal

Sun Pipe Line Company of Texas began operation of its new deep water terminal at Ingleside, near Corpus Christi, at the end of April. In the accompanying illustration showing the opening of valves at the terminal are, left to right: R. W. Pack, Philadelphia, Sun Oil Company director; S. E. Ogle, Beaumont, vice president and chief engineer; Hill Sanders, Beaumont, vice president and general manager, and W. C. Kinsolving, Philadelphia, president.

R. L. Gollum

Heads Atlas Production Sales

R. L. Gollum has resigned as assistant material supervisor for Socony-Vacuum Oil Co., Inc., New York, to become sales manager for the chemical and oil tool divisions of Atlas Production, Inc., Los Angeles. Before joining Socony, Mr. Gollum handled export sales for Security Engineering Co. Atlas handles drilling mud additives, well cleaning compounds and tools for cleaning liners.

Vulcan To Build TPC Plants

The Socony-Vacuum Oil Company, Inc., announced that it has authorized the Vulcan Copper & Supply Co. of Cincinnati, to design and erect units developed by Socony-Vacuum to produce ethylene and additional basic materials for the chemical and other industries. Known as Thermofor Pyrolytic cracking, the process is essentially a high-temperature conversion accomplished without the use of a catalyst by contacting the oil charge with a moving bed of inert granules raised to high heat. This vaporizes the oil and induces rapid high-temperature reaction. The heat-transfer granules pass continuously through contacting and heating stages. The resultant unsaturated gaseous hydrocarbons consist primarily of ethylene. The process is suitable also, according to Socony-Vacuum, for manufacture of certain aromatic hydrocarbon compounds.

Record Sales & Income Reached in 1948

(Continued from page 55)

& Refining Co., an affiliate of Standard (N. J.) ranked in second place last year. It paid out a total of $53,927,040 at the rate of $3 a share on its outstanding common stock as compared with $1.62½ paid out in 1946.

Standard Oil Co. of California was in third place, paying out the equivalent of $3.20 a share to equity holders, or a total of $41,612,650. In 1946 it paid $2.30 a share and in 1945 it paid $2 a share.

Other companies disbursing more than $10,000,000 a year in cash common dividends last year were The Texas Co., Socony-Vacuum Co., Inc., Shell Union Oil Corp., Standard Oil Co. (Indiana), Gulf Oil Corp., Sinclair Oil Corp., Phillips Petroleum Co., Ohio Oil Co. and Continental Oil Co.

In total the aggregate of payments by these twelve companies topped $406,000,000, or 65 percent more than the $248,000,000 paid out by all the twenty-three companies in the last prewar year of 1941.

The combination of higher earnings together with new financing by some companies is reflected in an improvement in working capital position of the group as a whole at the end of 1947. Working capital at December 31 last totaled $2,681,700,000, a new high record for these companies and an increase of $292,500,000 compared with a year earlier.

Only six companies showed unimportant decreases in such working capital, while the remainder had increases ranging from a few hundred thousand dollars to more than $232,000,000 in the case of The Texas Co. The latter's working capital at the year-end amounted to $363,780,648 and gave reflection to proceeds from the sale of stock late in 1947, mentioned previously.

Two affiliated companies of Standard Oil Co. (N. J.), namely, Creole Petroleum Corp., operating in Venezuela and Imperial Oil Co., Ltd., operating in Canada and in certain South American countries, which have been included in WORLD PETROLEUM's financial survey for years, also had sharply higher earnings in 1947 as compared with the previous year. Creole, for instance, earned $130,750,261, or the equal of $5.06 a share last year, while Imperial netted $20,464,381 or 75 cents a share on its capital stock.

Financial statistics such as net income, per share earnings, net working capital, net capital assets, funded or long-term debts, outstanding shares and surplus accounts, are shown in the accompanying tabulation for these two companies, as well as for 23 American companies whose shares are listed on leading stock exchanges.

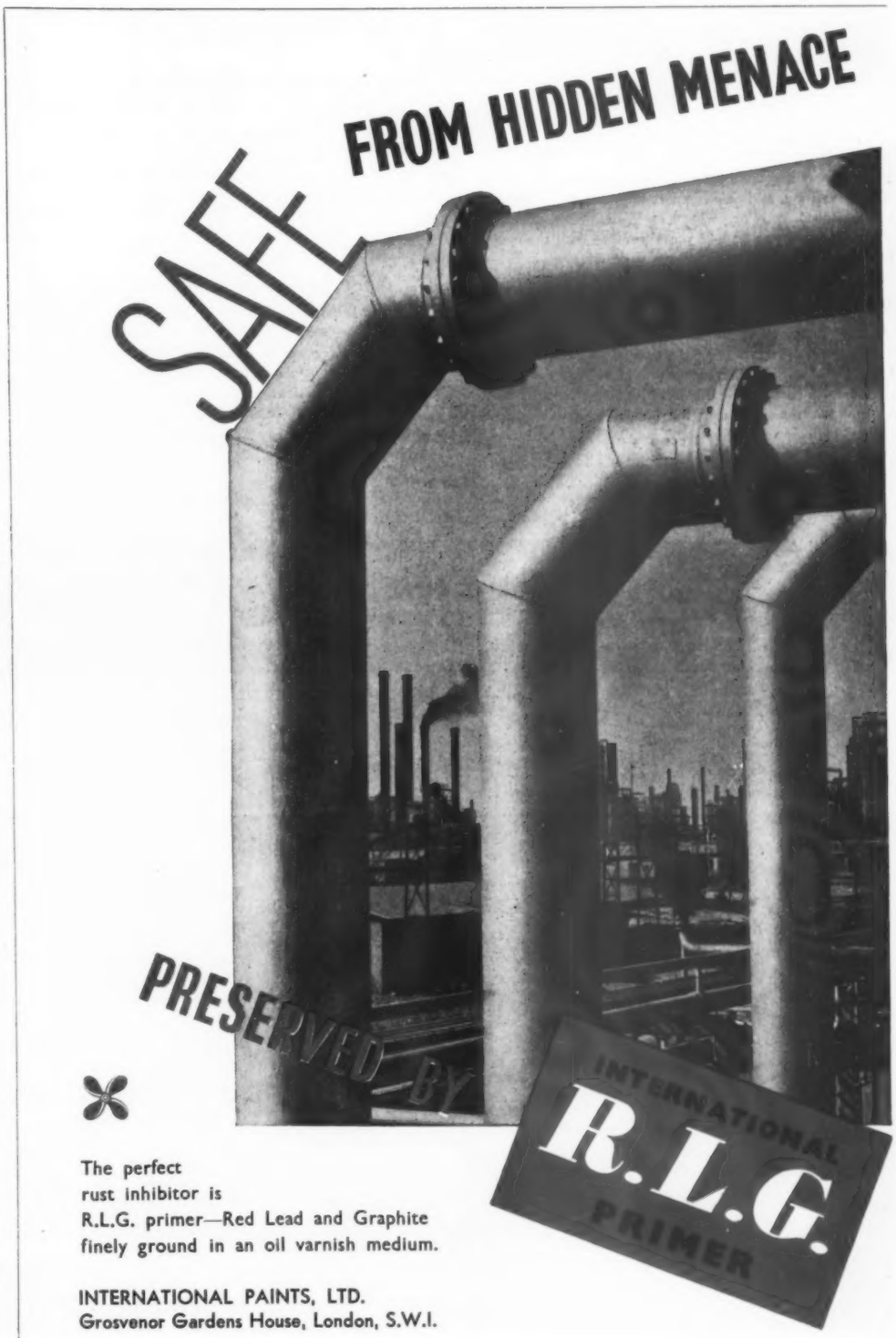
For the past several years the oil company managements, in line with the trend of the times, have endeavored to enlist a more active interest on the part of shareholders in company operation. Annual reports have ceased to be mere compilations of statistics and have blossomed out with illustrations that make them more attractive and understandable. This year the facilities of radio and television have been called into play by some companies to carry their story to a broader audience. One effect of these methods has been to bring about a larger attendance at annual meetings.

Elected Chairman of GATX

Lester Selig, who started work with the General American Transportation Corporation 33 years ago, was elected chairman at the recent annual meeting. Max Epstein, who has been chairman, was elected chairman of the executive committee.

After sometime in the GATX plants, Mr. Selig was appointed assistant superintendent at East Chicago. In 1919 after active service abroad in the armed forces during World War I, he was named assistant to the president and in 1931 was elected president. He was elected vice chairman of the board in 1945.

Mr. Epstein, a resident of Chicago since 1891, is known nationally as a business leader and philanthropist. He is donor of the Max Epstein Clinic at the University of Chicago and is a trustee of the University as well as of the Chicago Art Institute. He is a director of the Chicago Daily News, the Boy Scouts of America, and has numerous other interests. His home is in Winnetka, Illinois.



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M. J. Proud

Heads Allis-Chalmers Tractor Exports

M. J. Proud has been appointed manager of the Allis-Chalmers tractor division export department. He succeeds W. O. Taylor, who has headed this activity since 1934 and has had 42 years' service with the company. Mr. Proud has had three years of sales experience in Europe and Africa in addition to his various jobs with the company here in the United States.

Lion to Expand Chemical Facilities

Lion Oil Co. will increase the anhydrous ammonia capacity of its chemical plant at El Dorado from 430 to 570 tons per day through a $3,500,000 construction program. The new project also provides for the construction of some 4,000 tons of pressure storage for ammonia necessitated by the increased volume to be handled. Plant enlargement will be designed and supervised by Chemical Construction Corp., New York, the same company which acted as architect-engineers and supervised construction and initial operation of the plant. Engineering work is now in progress, and actual construction is expected to start in June, 1948, with completion of the entire project scheduled for the spring of 1949.

First Gas Turbine for Electric Utility

The first gas turbine for an electric utility in this country is under construction by General Electric Co. and will be shipped to Oklahoma Gas and Electric Co. at Oklahoma City early in 1949. The unit is a duplicate for the 4800-HP locomotive gas turbine first publicly announced in March and now undergoing tests. Waste heat from the exhaust will be used with a separate heat exchanger to supplement the present boiler feed water heating system.

Increase in Oil Prices

The British Ministry of Fuel and Power, in consultation with the Petroleum Board, has approved increases in oil selling prices as of May 1. Increase on white spirit was one penny per gallon; on diesel oil for road vehicles, burning oil (paraffin) and vaporizing oil, the increase was three-fourths penny a gallon, and on bitumen, nine shippings a ton.

Tourist Gasoline Allowances

The British Ministry of Fuel and Power has announced regulations under which tourists in the British Isles may obtain gasoline allowances this summer. Importers of foreign cars or buyers of new cars may obtain ration allowances based on length of stay ranging up to 1,600 miles in three months. Overseas visitors using hire cars or taxis also are allowed certain privileges.

W. S. Spicer Retires

Walter Sydney Spicer has retired after 47 years' service with Hadfields, Ltd., Sheffield. He joined the company at the age of 17 at the Hecla Works and was transferred to the East Hecla works as chief buyer in 1941 and appointed a local director in 1946.

Petroleum Board to Disband

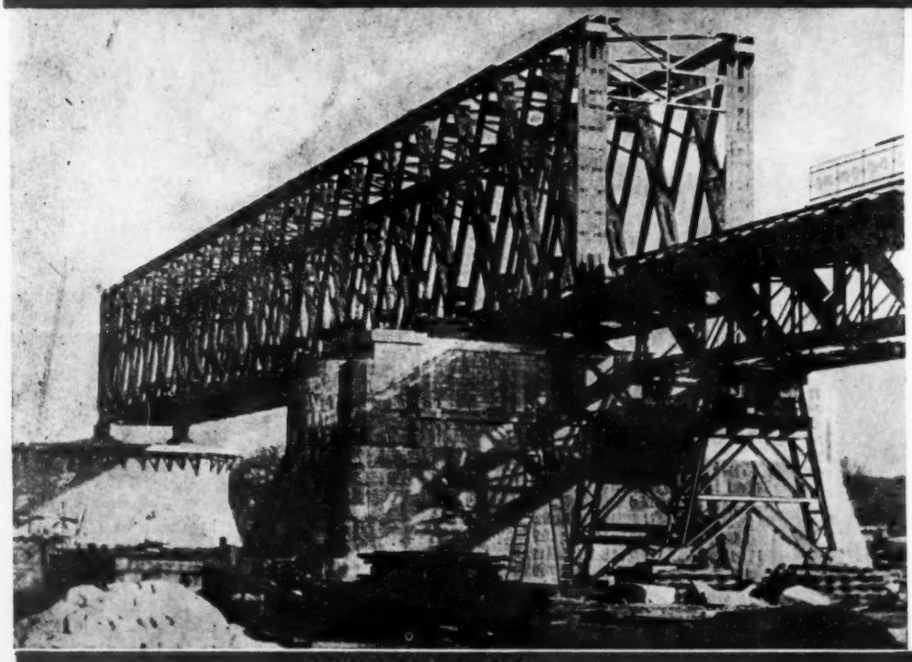
The Petroleum Board, controlling factor in the British petroleum sphere over the war years, will now finally end on June 30. Its termination has been rumored previously, but this is the first positive official notification of intention to terminate its life.

"At the request of the Minister of Fuel and Power," the Board announces, "arrangements have been made by the companies to ensure maximum economy in the use of manpower and transport, and they have agreed not to introduce branded products for at least six months. Two advisory committees have also been set up by the oil industry at the instance of the Minister to provide liaison between the industry and the government.

"The U.K. Petroleum Industry Advisory Committee will supply information to and cooperate with the government in safeguarding the national interest in all questions relating to supply, refining and distributing of oil in the United Kingdom. The other committee, the Oil Industry Advisory Council, will act in a similar capacity with regard to oil matters in general."

The authorities, it is assumed, will continue to fix selling prices, although the companies will, as from January next, be able to sell under branded names if they wish. The reintroduction of branded products will lead eventually to a revival of publicity along prewar lines.

240 FEET SPAN



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The Petroleum Register, 1948

The current 26th volume of this annual Directory and Register of all active oil enterprises throughout the work contains 91 more pages than its predecessor of 1947, thus reflecting the growth of the world oil industry and the multiplication of companies engaged in the production and distribution of this essential commodity.

The book is divided into two sections: a United States section and a Foreign section. The oil enterprises in the United States are classified under oil producers, oil refiners, wholesale distributors, natural gas manufacturers, liquefied gas manufacturers, compounders and grease manufacturers, transportation companies, drilling contractors, pipe line companies, pipe line contractors, trade associations and government bureaus, carbon black plants, process owners and licensors, producers of petroleum asphalt, road oil and native asphalt. The same detailed information is reported for all foreign countries insofar as enterprises in these classifications exist in those countries.

Each enterprise is described with reference to its history, capital and corporate structure, affiliations and subsidiaries, concessions properties, and facilities for production, manufacturing, transportation and distribution; the names and addresses of its directorate and important personnel are given, along with incidental information of interest to users of the volume. Individual operators are listed.

The book is distributed by Petroleum Register, which has offices in New York, Los Angeles and London. It is 8½ by 12 in., weighs 3 lbs. 11 oz. The price is $15, postpaid to any part of the world. Orders should be sent to Petroleum Register, 794 Stanford Avenue, Los Angeles 21, Calif.

Book on Synthetic Oil

Synthetic Petroleum from the Synthine Process, by B. H. Weil and J. C. Lane; published 1948 by Remsen Press, Brooklyn, N. Y.; 303 pages; $6.75.

This book is launched as the first systematic treatise in book form devoted exclusively to the fast-moving subject of producing synthetic petroleum by the now numerous variants of the Fischer-Tropsch process for artificially obtaining oil from carbon monoxide and hydrogen. The copious subject matter which the authors have collected is organized to show what is known and done in production of synthesis gas, the catalytic synthesis reactions, the resulting products, by-products and derivatives, and the basic economics of the proposition. There is a final chapter on the current situation giving some particulars of nine private projects in the United States and a summary of governmental research. Numerous authorities and patents are cited. There is a good index. Workers in this fields will find the book of interest.

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(For coupling bracing tubes to strengthen scaffold)

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BURTON'S PATENT DOUBLE COUPLER
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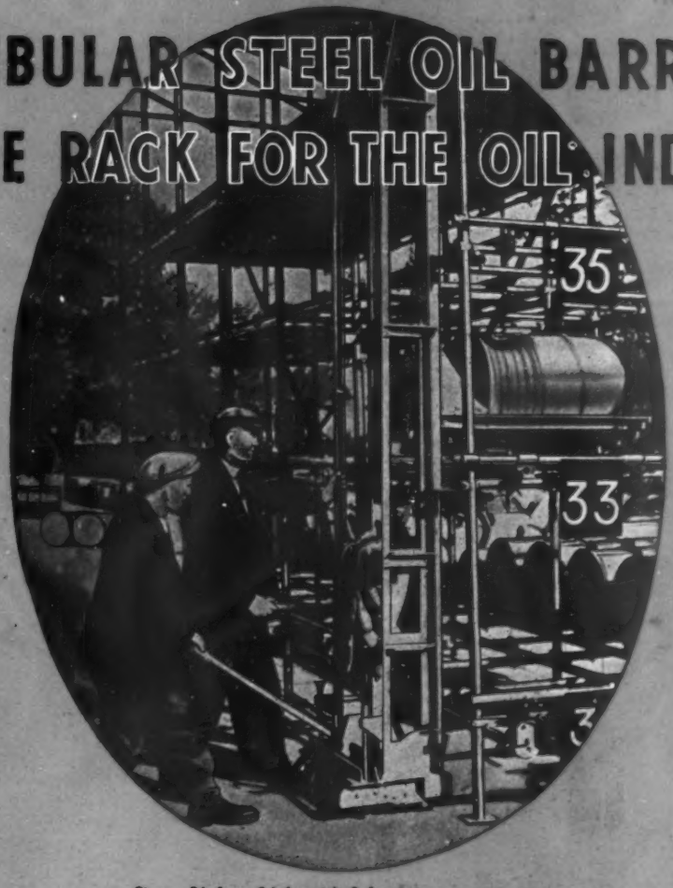

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F. A. Trim

London Representative Appointed

F. A. Trim has been made Universal Oil Products Company's representative in London, succeeding W. A. Keighley who has returned to Chicago as a member of the commercial development department. Mr. Trim joined Universal in 1934, and since that time has served as assistant to Dr. Victor Henny, former Universal representative, and later to Mr. Keightley.

Sinclair Raises Wages

Following negotiations between the company and the union, H. F. Sinclair, president, Sinclair Oil Corporation, and O. A. Knight, president of the Oil Workers International Union, CIO, in a joint statement announced May 10 that the Sinclair companies would increase the base wages of all employees in production, pipeline and and refinery operations 17½ cents per hour, effective July 1 when an existing agreement expires, subject to ratification by the membership of the union.

G. C. K. DUNSTERVILLE, assistant manager of operations for Caribbean Petroleum Company, Caracas, Venezuela, replaced W. E. Madden recently. Born in Bishopsteighton, England, and graduated from Birmingham University, Mr. Dunsterville began his professional career in 1925 and continued until 1943 as production engineer with Shell companies in California, Egypt, Holland, Romania, Venezuela, Trinidad and England. From 1943 to 1944 he was acting manager of Anglo-Egyptian Oilfields Ltd., with headquarters in Cairo. In 1945 he became general field superintendent for Cia. de Petroleo Shell de Colombia with headquarters in Bogota; and from 1946 until his recent transfer to Caracas, he was assistant manager there in charge of technical activities.

DR. E. W. CLARK, exploration manager for the Caribbean Petroleum Company of Venezuela, was born in Rushden, England, and studied at London University in the Royal School of Mines. Here he obtained the higher degrees in geology and oil technology. He worked in Venezuela in 1925, from 1931 to 1932, and from 1945 to the present. He was in Mexico from 1928 to 1929 and from 1932 to 1938. In the United States he spent six years, or from 1939 to 1945.

Dr. Clark's business experience includes the position of chief exploitation engineer for Cia. Mex. de Petroleo "El Aguila" from 1934 to 1938. In the United States he was chief subsurface engineer from 1939 to 1941 for the Mid-Continent area, for Shell Oil, Inc., Tulsa, Oklahoma. He was made Oklahoma division manager for the same company in 1941, and Kansas division manager from 1942 to 1944. In Venezuela he was assistant manager for Shell in Maracaibo from 1945 to 1946; and in 1947 was promoted to the position of exploration manager, with headquarters in Caracas. Dr. Clark has been with the Shell Company since 1927.

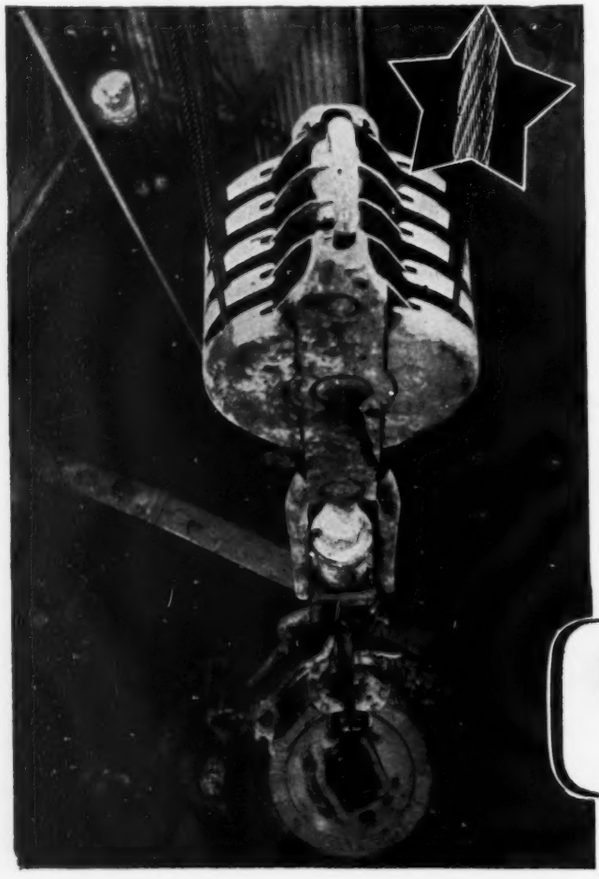
Atlantic Exercises Option

Atlantic Refining Co. has exercised its option with Pantepec Oil Co., of Venezuela, C.A., to acquire a 50 percent interest in the concessions in Venezuela aggregating 326,147 acres. Pancoastal Oil Co. C.A., which under the reorganization recently approved, succeeds to all of Pantepec's rights under the Atlantic agreement, will receive $2,000,000 in cash and a credit for drilling expenses of $500,000.

Petroleum Production

Petroleum Production, Vol. IV: Condensate Production and Cycling, by Park Jones. Published 1948 by Reinhold Publishing Co., New York; 238 pages; $5.00.

The fourth volume of this notable series on petroleum production is devoted to an exposition concerning petroleum deposits consisting of hydrocarbons that exist as gases which turn to liquids when they are relieved of the high pressure and temperature which prevail in the reservoirs that contain them. The problem of the operators of condensate fields is to bring these gases to the surface without allowing them to lose pressure and temperature sufficient to cause them to turn back into liquids and thus become more or less irrecoverable. This operation is a delicate one unless strict attention is paid to the laws of gases which are compressed beyond their critical points. In this volume Mr. Jones states these laws with clarity. Besides stating and elucidating the foundation principles, he has covered their applications in numerous cases that have come up. It is a book to be owned and used by every engineer who has anything to do with condensate fields.



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